A Lecture
ON
CARCINOMA OF THE COLON.

DELIVERED AT THE MEDICAL GRADUATES' COLLEGE AND POLYCLINIC.

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THE large bowel, in marked contrast to the small intestine, is very prone to malignant change; the irritation caused by the bowel contents, which progress slowly and may be hard in consistency, is probably accountable for this, though some other reason must be sought for the frequent incidence of cancer in the caecal region, where the contents are fluid. In the latter position, however, bacterial action is at its maximum, and this may be of significance as a predisposing factor to cancer.

I am not concerned here with carcinoma of the rectum, but with those cancers affecting the bowel from the caecum or caput coli to the recto-sigmoidal junction, situated opposite the third piece of the sacrum. The subject is important, both on account of the frequency of the condition and because recent advances in diagnostic methods and treatment have greatly improved our chances of dealing radically with the disease. That it is comparatively frequent may be judged from the fact that out of over four thousand general surgical cases admitted to the wards of St. Mary's Hospital during the past two years, twenty were cases of cancer of the colon—a proportion of about one in two hundred.

Some parts of the colon are more frequently attacked than others. Taking the distribution of 100 cases, at least 36 would be situated in the sigmoid (iliac and pelvic) colon, and about 25 in the caecum. The transverse colon and splenic flexure, the hepatic flexure, and the ascending and descending colon are accountable for the rest in about that order of frequency. Certainly the ascending and descending portions are the least often affected. Statistics vary considerably, and can only be obtained approximately. Of 20 cases which I have had cognizance of at St. Mary's during the last two years, 11 occurred in the iliac and pelvic colon, 3 in the splenic flexure, 2 at the hepatic flexure, 2 in the caecum, and 1 each in the descending and transverse portions of the colon.

The microscopic anatomy in practically all cases is that of a columnar-celled carcinoma, which arises from the glands of Lieberkühn. Wide variations exist in the reaction of the connective tissue to the invading cancer cells. In those instances where there is slight resistance to its advance a tumour forms by the extension of the growth both along and round the bowel. This form is prone to degenerative and ulcerative changes. In other cases the cancer is strenuously resisted by the formation of connective tissue, which contracts and strangles the advancing cancerous cells. This progress is comparable to the slow advance of an atrophic scirrhus of the breast, with the important difference that the breast complaint may not cause any marked inconvenience for years, whilst the bowel lesion tends to obstruct the lumen exactly in proportion to the natural attempts at cure. The lymphatics and blood vessels course round the bowel wall in a circular fashion, so that a ring of involved tissue is soon formed. We can, therefore, recognize two main clinical types—the first with tumour formation growing fairly rapidly; the second with no tumour to be felt, but causing a hard, malignant ring, which constricts the bowel. This ring growth is often very narrow, and has sometimes the appearance as if a piece of string had been tightly tied round the bowel. If one recalls the normal sacculations of the large bowel, it will easily be appreciated how it may need a very careful search to discover the puckered ring, even when the hand is inside the abdomen. There is a third and rarer variety of cancer of the colon which deserves a passing mention—that is, the malignant growth taking origin from a simple adenomatous polypus.

The progress of cancer of the colon is usually comparatively slow. It has been stated to be the least malignant of the carcinomata.[1] For a long time the disease is limited to the bowel, and the lymphatic glands are involved later than is the rule in most other parts of the body. One observer[2] found that in 40 per cent. of fatal cases the disease was limited to the gut. This would probably prove to be an under-estimation of the frequency of gland involvement if a larger series of cases were taken. The profession owes a debt to Jamieson and Dobson,[3] who thoroughly worked out the lymphatic drainage system of the colon, thus paving the way for the performance of scientific radical operations. These observers found that the lymph drained into four groups of glands—the epicolic, situated on the bowel wall; the paracolic, close to the gut on the vascular arches; the intermediate group lying on the arterial branches between the vascular arcades and the main trunk; and the main set grouped round the colic arteries close to their origin. Lymphatics run from the bowel wall direct to the epicolic and paracolic glands, sometimes to the intermediate, and occasionally to the main groups. From the transverse colon and splenic flexure most of the lymphatics are stopped at the paracolic group. Cancer may infect any or all of these gland stages, and even form metastases in the liver, although this is uncommon until late in the case.

The local changes which result vary according to the type of growth. The first type, which grows rather quickly and forms a palpable tumour, is not so apt to cause intestinal obstruction; it is more cellular and softer than the second type, and though it may project into the bowel lumen so as to impede the advance of the contents, yet ulceration commonly minimizes or removes such obstruction. It is also more likely to spread to neighbouring organs and cause infiltration of adjacent viscera, such as bladder, kidney, and pancreas; infection of the ulcerated surface occurs, and the symptoms of colitis result.

The second type, or annular scirrhus, produces a slow but sure narrowing of the lumen of the gut. This leads to hypertrophy immediately above the growth. This compensatory hypertrophy continues *pari passu* with the increasing obstruction until urgent symptoms arise from an attack of acute intestinal obstruction. It is a curious fact that in such an event the caecum is usually the most distended portion of the gut, even though the obstruction be so far on as the sigmoid flexure; this distension may proceed almost to bursting point. At least a partial explanation of this may be afforded by the researches of Cannon[4] and others, who have shown that antiperistalsis is one of the normal movements of the ascending and transverse portions of the colon. It is possible that an organic obstruction may produce storms of antiperistaltic waves ending at the caecum, which consequently becomes greatly distended.

SYMPTOMS.

The signs and symptoms of cancer of the colon differ along with its pathological characteristics. There is no constant, ordered sequence of symptoms, for any one of a large number may be the first noticed. Constipation, diarrhoea, vomiting, pain, a tumour, increasing distension of the abdomen—one or several of these may herald the condition. A point to be laid stress upon is that the condition may be latent, and an attack of acute or subacute obstruction may be the first serious symptom to which attention is drawn. This is especially true of the scirrhous type. It is quite common to meet with cases which furnish a history of only a few weeks' constipation in which the growth as seen at operation certainly must have been growing for a much longer period. It is therefore all the more necessary to pay attention to slight symptoms of bowel trouble, so that, if possible, we may detect any morbid condition in the earliest stages.

The symptoms may be classified under six headings, but it must be remembered that the combinations of symptoms are varied and only one or two may be present in any particular case.

1. *Symptoms due to Bowel Obstruction.*

Under this heading come pain, constipation, distension, nausea, vomiting, and visible peristalsis. The pain is due to the contractions of the gut above the narrowed part, and, like all violent contractions of circular involuntary muscle, is cramp-like or colicky in character. Usually it has no direct time relation to the taking of food, but is often increased by taking aperients. In one patient whom

I saw the taking of sweet things increased the pain. Very frequently the site of the maximum pain indicates the position of the growth. Hertz has shown that intestinal pain is chiefly due to distension; if we consider a peristaltic wave passing along the bowel, the pressure inside the lumen would certainly be greatest just above the obstruction, and in the colon, unlike the small intestine, pain is localized fairly accurately. In view of the reversal of peristalsis which may occur in the right half of the colon, one would expect to find cases where obstruction of the distal part of the colon caused pain in the caecal region; I have seen clinical evidence to support this. Sometimes the patient will describe the pain as travelling across the abdomen and increasing in intensity up to the site of maximum pain. The pain during the early stages is commonly mistaken for indigestion, and if accompanied by nausea or sickness is attributed to a "bilious attack." Vomiting is an infrequent occurrence until rather late, for the large bowel is much more tolerant of obstruction than the small intestine.

Gradually increasing constipation is often the first abnormality, and if this supervenes in a person over middle age who has previously been perfectly regular as to the bowels, suspicion should be aroused and a thorough investigation carried out. By constipation is meant the abnormally infrequent or insufficient passing of formed faeces. The consistency must be ascertained, since the so-called spurious diarrhoea due to irritation may cause frequent but ineffective movements of the bowel. Alternating constipation and diarrhoea may thus occur. Occasional attacks of distension and flatulence are common. The distension may be limited to the region of the abdomen where the colicky pains are greatest. It may happen that the gradual increase in size of the abdomen may first cause any alarm. Visible peristalsis may sometimes be watched through the abdominal wall, and local swelling may subside with a gurgling sound due to passage of flatus through the stricture.

All the above symptoms are frequently so slight as to be regarded as trivial, and completely neglected by the patient, so that it is a common event for an attack of acute intestinal obstruction first to compel attention.

2. *Symptoms due to Bowel Ulceration.*

Diarrhoea and the passage of blood and mucus may result from ulceration of the bowel. As a rule, the bleeding is a little-marked feature, but rarely quite profuse haemorrhage may ensue, doubtless due to erosion of a vessel of some size. If the cancer is high up, the blood may be dark and resemble melaena. No doubt occult blood would frequently be found in the faeces if it were more commonly sought after. Mucus is frequently passed, and is probably due to the irritation of the glands of the mucous membrane caused by the growth and its attendant bacteria, which readily thrive either amidst the obstructed bowel contents or on the ulcerated surface of the cancer. The fact deserves wider recognition that mucous colitis is often merely a symptom of some more serious disorder. The last two cases of mucous colitis which I have seen proved on further investigation to be due to tumour of the kidney and carcinoma of the sigmoid respectively.

It would appear that diarrhoea can result from two causes. We have already mentioned the spurious diarrhoea, or the diarrhoea of constipation; in other cases I believe extensive ulceration at the site of the growth is sufficient to cause it even when no obstruction is present. The fact that diarrhoea may occur should be remembered, for it may lead patients to assert that the bowels are regular. I know of one patient who suffered from diarrhoea for eighteen months before the disease was discovered.

3. *The Presence of a Tumour.*

A tumour is frequently felt. It may attain a considerable size before it is noticed. It is prone to break down into the bowel lumen, consequently obstruction and pain are not so marked. In the early stages the tumour is often mobile, especially when situated in a part which has a long mesentery, as the transverse or pelvic colon; mobility also occurs with tumours of the hepatic flexure, which moves with the right kidney on respiration. Fixation occurs when any pericolitis supervenes.

4. *Symptoms due to Extension to other Viscera.*

The symptoms due to extension to other viscera vary according to the organ or viscus involved. It may implicate the kidney or bladder, and give rise to symptoms suggestive of stone or other disease liable to attack those viscera. It may infiltrate the stomach wall and cause simulation of gastric disease. Ulceration may cause fistulous connexion between a part of the colon and small intestine, or another part of the colon. It is uncommon to meet with serious extension to other organs.

5. *Symptoms due to Pericolitis and Peritoneal Infection.*

Pericolitis, or inflammation of the tissues round the colon, may be consequent on ulceration and extension of a malignant growth. A local abscess may form and mask the primary condition. Sometimes perforation of the bowel suddenly takes place into the general peritoneal cavity, and diffuse and fatal peritonitis ensues.

6. *General Symptoms, Loss of Weight, etc.*

General symptoms are absent at first. The patient often looks robust. Later, as the growth advances, loss of weight occurs, and anaemia and cachexia develop, but a large number of patients come to a fatal ending from obstruction before they have wasted to any noticeable degree.

DIAGNOSIS.

Any patient who complains of the recent onset of symptoms which might be attributed to cancer of the colon needs, and should obtain, a most complete examination. Bowel irregularity supervening after middle age should never be overlooked. After obtaining a careful history of the case, examination should be carried out on the following lines: The abdomen should be inspected to detect unusual fullness, distension, or visible peristalsis; palpated to find any tumour, and percussed in the flanks to see if there is any free fluid. It must be remembered that the transverse colon often sags down to the iliac fossa or pelvis, and that the sigmoid may be on the right side of the middle line. Little help is gained by auscultation, since borborygmi are usually audible without the help of the stethoscope.

A digital rectal examination is imperative. A cancer of the pelvic colon may occasionally be thus felt, for it sometimes prolapses into the lower portion of bowel, which may be ballooned. I recently felt a growth 8 in. from the anus by this means. This prolapse is apt to mislead as to the true distance of the growth from the anus. It is also important to make a bimanual recto-abdominal examination, for some small mobile growths of the pelvic colon can thus be detected.

Since a large number of colon cancers occur in that part which is suitable for endoscopy, there is no reason why the majority of them should not be revealed at an early stage by the use of the sigmoidoscope. Endoscopy of the sigmoid is free from risk if due precautions be taken, and furnishes most valuable information. Sigmoidoscopy can be carried out without an anaesthetic, though in some cases it is better to administer one. The patient (after as thorough a preparation of the bowels as is possible) is put into the Sims's or knee-elbow position, and the warmed lubricated end of the instrument inserted gently just within the anus. The obturator is then taken out, the light inserted, and by the aid of inflation the end of the sigmoidoscope can be safely passed up, *the observer watching continuously the opening channel which the instrument has to traverse.*

There is another valuable method of diagnosis which has only comparatively recently been adapted for the assistance of the surgeon. I refer to the taking of an *x*-ray photograph of the abdomen after the administration of a bismuth meal. Two ounces of an inert salt of bismuth (carbonate, subnitrate, or oxychloride) are mixed up with a pint of bread and milk and administered to the patient. At the time when the mixture should have reached the colon an *x*-ray photograph is taken showing the bowel filled with the material which is impervious to the rays. Any stricture is beautifully demonstrated, for the bismuth mush becomes massed on the proximal site of the obstruction, and a thin line may indicate its slow progress through the stricture. It has been found experimentally that food takes about four hours to reach the caecum, and from this it takes

about two hours to traverse each of the ascending, transverse, and descending parts of the colon. If it is thought that the obstruction is in the lower sigmoid, then the bismuth emulsion can be administered as an enema given in the knee-elbow position, and possibly through the sigmoidoscope. This method of diagnosis is still in its infancy, but is destined to enable us to diagnose the obstructing form of colonic cancer at an early stage. Similar methods have proved extremely useful in tracing the outline and fixing the position of oesophageal strictures.

In spite of all these methods, there will remain some cases which present indefinite symptoms and in which diagnosis is doubtful. The question of an exploratory abdominal section then arises. If the general condition is good enough, this is a justifiable and necessary procedure, and should be strongly urged upon the patient; but in constitutionally feeble subjects it is not wise to open the abdomen unless the indications are very definite.

The conditions from which cancer of the colon has to be distinguished, and for which it is often mistaken, are numerous. The early symptoms of obstruction, colicky pains, flatulence, and occasional vomiting, are frequently ascribed to dyspepsia. When a more acute attack of obstruction supervenes, several conditions need to be excluded. Some help is afforded by the fact that, excluding strangulated herniae, cancer of the colon is the commonest cause of acute obstruction in persons over middle age. Volvulus is likely to give rise to more acute symptoms, and the distension to come on more rapidly. Intussusception in the adult is rare, and when it does occur is sometimes caused by a malignant growth. Simple stricture of the colon cannot be diagnosed from cancer before operation; indeed, a microscopical investigation is sometimes needed to distinguish. It is well known that symptoms due to obstruction of the large intestine are much less acute than those resulting from a similar obstruction of the small gut. Vomiting is less marked, and comes on later, whilst pain is usually much less acute. This is what one would expect, for the fluid contents of the jejunum and ileum pass along quickly at the rate of 5 ft. an hour, whilst the colon usually retains its more solid contents for many hours, and may do so in some cases even for days or weeks without any serious consequences.

There is sometimes an intermittence in the acute obstructive symptoms caused by cancer. In February last a woman, aged 43, was admitted to St. Mary's as an urgent case with a history of a week's constipation, abdominal pain, and vomiting, which had become faeculent. Prior to this attack she had had no abnormal symptoms. On admission vomiting had ceased, pulse and temperature were normal, there was no distension, and the only complaint was that of a little pain in the left hypochondrium. No tumour could be detected. In view of the short history and the absence of physical signs, I was at first inclined to attribute the condition to gastric derangement. She was given small doses of calomel, and, in order to test the question of obstruction, two consecutive turpentine enemata were administered with a few hours' interval. Only flatus came away, and for twenty-four hours the patient was comfortable; then suddenly she vomited a large quantity of faeculent material and became rapidly distended. When I opened the abdomen I found a narrow annular growth in the splenic flexure. I performed caecostomy, and a fortnight later successfully excised the segment affected. In the same month I operated on a case of sigmoid growth in a man of 68, in whom symptoms remitted, but increased rapidly after the giving of an enema. These cases serve to show how acute symptoms may suddenly become quiescent and deceive the observer. In both cases the giving of an enema appeared to cause an aggravation of the condition. It has been proved by Cannon[4] that in cats the giving of rectal injections stimulates antiperistalsis in the colon; a similar mechanism may partially explain these cases.

I have referred above to the real danger of mistaking a case of colon cancer for ulcerative or mucous colitis, especially in older people.

Those cases that come under observation with a tumour may be rather puzzling. In the caecal region such a lump can be mistaken for chronic appendicitis or hypertrophic tuberculosis of the caecum. A careful history should distinguish the former, but the latter may be indistinguishable from cancer unless tubercle bacilli are discovered in the faeces, or one of the tuberculin tests or the opsonic index give positive indication. Absolute diagnosis is not so important, since excision is probably the best treatment for hypertrophic tuberculosis. At the hepatic flexure tumours of the kidney, liver, and gall bladder have to be excluded. I personally know of one case, and have read of another, where cancer of this flexure was mistaken for a mobile kidney. The shape of the tumour is not reniform, however, and careful inquiry usually elicits a history of some bowel irregularity. In the transverse colon and splenic flexure the tumour may be mistaken for gastric carcinoma, but anaemia and loss of weight are more marked in the latter, and the pain has direct relation to the taking of food. Analysis of a test meal is important.

When the cancer invades or becomes adherent to neighbouring viscera it causes symptoms of a misleading nature. All or some of the many methods of diagnosis in vesical or renal diseases can be utilized if symptoms be referred to those organs; if the stomach is invaded it may be very difficult, apart from the history, to say in which part the disease began.

When general peritonitis ensues on the perforation of the gut, diagnosis of the cause may not be made till the abdomen is opened; when localized pericolitis causes abscess formation on the right side it may easily be mistaken for an appendix abscess.

PROGNOSIS.

The prognosis of cancer of the colon is bad unless the condition is treated by operation. A fatal result follows from acute obstruction, involvement of other viscera, general peritonitis, or progressive anaemia and asthenia. The less malignant the growth, or the more the cancer is resisted locally, the sooner the obstructive symptoms arise, but, at the same time, the better the outlook for operative measures.

TREATMENT.

The treatment of cancer of the colon is surgical save for those cases which have gone too far for excision and which present no obstructive symptoms. We might possibly also except some low sigmoid growths to which it would be possible to apply radium by means of the sigmoidoscope. The manner of treatment varies with the stage of the disease and the state of the patient when brought under observation.

Cases without Acute Symptoms.

In judging which is the best operation to adopt in cases which are suitable for excision and present no acute symptoms, it must be borne in mind that the patients are often old and feeble, and that the cancer tends to destroy life as much by intestinal obstruction as by extension and metastases. In quite a considerable percentage of cases metastases are late in appearing, even in the adjacent glands. When the conditions warrant it, however, one should perform the ideal operation, which consists in the excision of the growth and as much adjacent bowel as may be necessary, together with the lymphatic drainage area of the affected part. Jamieson and Dobson have worked out the principles of such operations for each part of the colon. The main blood vessel supplying the diseased part has in most cases to be ligated, and all the bowel depending upon that artery for its chief blood supply must be removed. In cancer of the caecum the ileo-colic artery is tied just below the duodenum, and the last 6 in. of ileum, the caecum and colon to just beyond the hepatic flexure are removed, together with the peritoneum covering and the lymphatic glands lying along the ileo-colic artery and its branches. For a growth at the hepatic flexure the bowel must be removed from the end of the ileum to the left third of the transverse colon, since the middle colic artery has to be ligated. Cancer of the transverse colon commonly does not affect more than the paracolic glands until very late, for no lymphatics run direct to the intermediate or main groups, so that a resection of the growth with a few inches of gut on each side and the adjacent mesentery is sufficient. A limited excision is also advisable for the splenic flexure, for from this part some lymphatics go to the splenic glands which could not be removed thoroughly. When the descending colon is involved the left colic artery is ligated and the bowel removed from the left third of the transverse colon to the beginning of the iliac colon.

Growths of the pelvic colon are dealt with by ligating the inferior mesenteric artery below the origin of the left colic and excising most of the sigmoid loop with mesentery and contained glands.

Though the colon frequently has no proper mesentery in its ascending and descending parts, and at the hepatic and splenic flexures, yet it can be mobilized sufficiently to bring it out of the abdomen by cutting through the peritoneum as it is reflected from the outer side on to the posterior abdominal wall. Care has to be taken to avoid injury to such important structures as the duodenum, ureter, vena cava, and spermatic vessels.

Though in suitable cases—the number of which should increase considerably as we diagnose the condition earlier—these operations are to be carried out, yet practical experience has shown that good results can be obtained by a more limited operation. Many operators have reported cases in which they excised the local growth, but left enlarged lymphatic glands, and yet the patient kept well for many years. In some of these cases the glands were probably inflammatory; but doubtless there are some cases where the tissues of the individual can overcome the migrating cancer cells. Lockhart Mummery, in thirty cases where he looked for enlarged glands at operation, found the mesocolic glands enlarged in five, and the retroperitoneal in two instances, whilst two cases had metastases in the liver.

With a limited excision the cancerous segment is removed along with a sufficient margin of healthy bowel on each side. Regard must be paid to the blood supply of the bowel which is left, and if this is imperilled more bowel must be removed. The procedure may be performed in one or more stages.

Operation in One Stage.

This is never admissible unless the bowel can be well emptied beforehand. There is not a consensus of opinion as to the best way of dealing with the severed ends of the bowel after the diseased segment has been excised. In theory the ideal method would be to perform end-to-end suture, and this has been done with success. But such a method has several drawbacks when applied to the large intestine; the sacculation of the bowel, the presence of appendices epiploicae, and the absence of a complete peritoneal investment may render it difficult, added to which in some parts the suture line will have to stand the strain and irritation of solid faeces. If there has been marked obstruction, the difference in calibre between the proximal and distal ends may be considerable. End-to-end union is more suitable for those cases in which a colostomy has previously been done for obstruction; this obviates any strain on the suture line.

Another method is to excise the diseased part, close the cut ends, and perform lateral anastomosis between the proximal and distal segments. Mayo[5] says that such anastomosis should always be isoperistaltic in dealing with the colon. Leakage may occur from the closed ends and cause peritoneal infection; to avoid any risk of this, Bloodgood[6] has suggested bringing the closed ends out of the abdomen. End-to-end union by means of a Murphy button has been performed occasionally with success, but this would now hardly be considered sound surgery.

In excision of the caecum or right half of the colon the best plan is to cut across the ileum near its termination and implant it laterally into the transverse or pelvic colon.

Operation in more than One Stage.

By operating in two or three stages the mortality has been more than halved. One of the safest and best known methods is that devised by Paul of Liverpool, who practically made the operation an extraperitoneal one. The affected loop of gut is brought outside the abdomen, and the vessels in its mesentery ligated. The mesentery is then cut across, and the proximal and distal portions of the loop sutured together. The portion requiring excision is then cut away and a glass tube inserted into each end to drain away the intestinal contents. Later the spur between the two ends is crushed and the continuity of the gut re-established. The artificial anus left after crushing the spur can be closed by a later plastic operation. The primary operation can be modified by leaving the excision of the cancerous portion till a few days after bringing the loop of intestine outside the abdomen. The drawback to Paul's operation is that only a limited segment of mesentery with its contained glands can be removed.

A type of two-stage operation which is sometimes carried out is that in which the affected segment is first short-circuited and later excised. The short-circuiting can be done by lateral implantation, or lateral anastomosis. This method provides a cleaner field of operation at the time of excision.

Cases with Obstruction.

When there is acute or subacute obstruction present, that condition must first be treated. A similar method is advisable when the bowel cannot be properly emptied before operation. In a case of acute obstruction the part behind the stricture is filled with bacterial toxins, which not only poison the patient but render impossible any radical operation involving suture of intestine. In such cases the immediate indication is to perform caecostomy or colostomy above the obstruction, and later excise by one of the above-mentioned methods.

In some cases presenting marked obstructive symptoms Paul's operation may be carried out.

In those cases which have progressed too far for excision to be practicable or advisable, surgery does not need to step in unless symptoms of obstruction are threatening or some special complication exists. Obstruction is treated by short-circuiting the strictured part or opening the bowel above it. Occasionally bilateral exclusion may be deemed advisable; in this the bowel is cut across above and below the neoplasm, between it and the site of lateral anastomosis which has been previously performed. One end of the excluded portion is brought to the surface so as to drain away the foul contents, which if retained may lead to distension and leakage into the peritoneal cavity. The other end is either closed or also brought to the surface.

If local peritonitis, abscess formation, or general peritonitis result from carcinoma of the colon such conditions must be treated first, and the growth excised or short-circuited later if the patient recovers from the complication.

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APPENDICITIS:

THE RESULTS OF OPERATIONS UPON 619 CASES.

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I WISH to record here the lessons to be derived from the results in 619 cases of appendicitis submitted to operation. I have divided the cases into several classes, each of which includes a well-marked group.

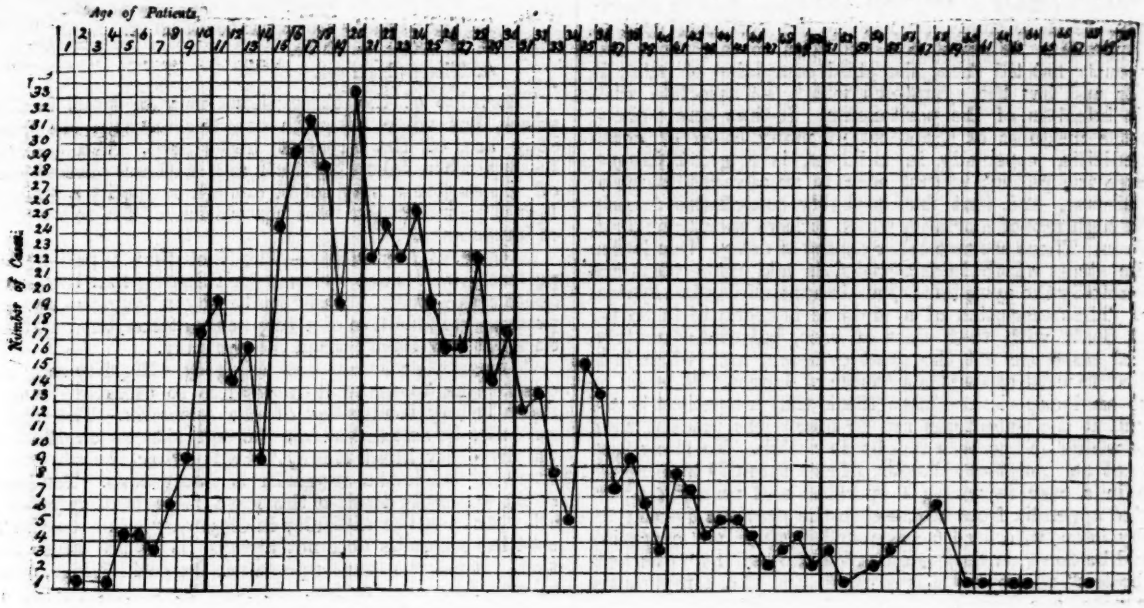
1. "*Interval*" *Cases.*

This includes those cases in which there had been one or more attacks of appendicitis and in which the operations were performed while there was no active inflammation. It does not include any cases in which the appendix was removed in the course of an abdominal section performed for some other condition, merely because it was an appendix. Such removal of the appendix does not appear to me to be either a wise or justifiable procedure. There were 113 cases and no deaths.

2. *Acute Cases.*

(*a*) *Early cases*, in which the inflammation was confined to the appendix itself. The appendix was removed in each case, but no drainage of the wound was necessary. There were 63 cases and no deaths.

(*b*) *Later cases*, in which there was localized peritonitis. In all of these cases the appendix was removed and drainage of the wound was necessary. There were 93 cases and 2 deaths.



3. *Abscess Cases.*

(*a*) Cases in which the abscess was localized. In all these the appendix was removed and the wound drained. There were 274 cases and 11 deaths.

(*b*) Cases in which the abscess was localized and was drained, the appendix *not* being removed. These include some cases in which the abscess was bulging into the rectum and was opened per rectum; others in which, on account of the size of the swelling, it was not thought advisable to search for the appendix; and others in which, on account of the density of the adhesions, the same treatment was adopted. There were 25 cases and 1 death.

4. *Acute Cases with General Peritonitis.*

(*a*) Cases in which the appendix was gangrenous and had given rise to general septic peritonitis, *without* the formation of a local abscess—that is, "fulminating" cases. In all these the appendix was removed and the wound drained. There were 29 cases and 20 deaths.

(*b*) Similar cases, with the complication of an abscess, and in which the appendix was removed and the wound drained. There were 20 cases and 14 deaths.

(*c*) Cases in which the patient was so ill that the peritoneal cavity alone was drained. There were 2 cases and 2 deaths.

By arranging the cases, as in the following table, according to this classification it will be seen that there is a rise in the relative mortality which followed operations as they were performed during later and later stages of the disease.

TABLE I.

	Cases.	Deaths.	Per Cent.
1. "INTERVAL" CASES	113	0	Nil
2. ACUTE CASES:			
(*a*) Early: Appendix removed, wound not drained	63	0	Nil
(*b*) Later: Appendix removed, wound drained	93	2	2.1
	156	2	1.28
3. ABSCESS CASES:			
(*a*) Appendix removed, wound drained	274	11	4
(*b*) Appendix *not* removed, wound drained	25	1	4
	299	12	4
4. GENERAL PERITONITIS:			
(*a*) "Fulminating" cases: Appendix removed, wound drained	29	20	69
(*b*) With localized abscess: Appendix removed, wound drained	20	14	70
(*c*) Very ill: Peritoneal cavity drained	2	2	100
	51	36	72.5
Total	619	50	8.1

The age incidence is most clearly seen in the chart, in which the horizontal lines represent the number of cases, and the vertical lines the age of the patients. From this it will be seen that the largest number occurred amongst those of 20 years of age, and that more than half of the total number of patients were between the ages of 15 and 28 years (330 out of 619).

Here, then, is a story of steadily advancing mortality in exact relation to the stage at which the inflammatory process had arrived before the appendix was operated upon. There is nothing new in such a tale. It has been told repeatedly, and yet there does not seem to be any diminution in the number of fatal cases. How are we to account for that? I believe that there are several reasons.

1. Many patients do not call in a doctor until complications have already arisen.

2. It is, perhaps, not fully realized that the highest mortality occurs amongst cases which have a very mild onset.

3. Most of the writing, both in textbooks and in periodicals, has reference to the treatment of the complications of appendicitis, rather than to appendicitis itself, so that, in the minds of many, these complications are regarded as though they were actual symptoms of the disease.

4. Many medical men have a habit of looking for certain well-known and true symptoms of appendicitis, and they expect that all those symptoms must necessarily be present in each case before a definite diagnosis can be made.

In the case of young children one is often told that the attack began very suddenly, perhaps the evening before the child is seen, and that the child vomited and complained of pain in the right iliac region. It is looked upon as in every way a typical attack, of an acute kind, and, the child being obviously ill, the appendix is removed without delay. At the operation in such a case one finds an acutely inflamed, perforated, or even gangrenous appendix. In almost all such cases in young children, if inquiry be made, it is found that the child has been "peevish" for a day or two before the onset of pain; it has not taken its food well, and has been generally "out of sorts." I have operated upon many such children, even within a few hours of the onset of acute symptoms, and the condition of the appendix has been such that it was impossible to believe that so much destruction could be effected in so short a time. Apparently, in children, acute appendicitis begins as an inflammation of the mucous membrane, exactly the same as acute tonsillitis, and the child is similarly ill. Doubtless if the appendix were palpated it would be found to be tender, but there is

no complaint made of any local abdominal pain or tenderness until the inflammation reaches the peritoneal coat of the appendix. When it has extended so far, then, and apparently not till then, the child complains of pain; it vomits and has the symptoms which we associate with septic infection of the peritoneum. It thus comes about that the mildness of the onset in many cases of acute appendicitis, especially in children, is a great danger, because the patient is first seen in an advanced stage of the disease, and that fact probably contributes largely to the high rate of mortality which follows operations upon children. There are two other causes of delay. One is due to the stress which, in textbooks, is laid upon what are undoubtedly the symptoms of acute appendicitis in a typical case. The description of symptoms is accurate in so far as it deals with that class of case, but, unfortunately, typical cases are not the most common, and when it is applied to mild cases it is a source of danger. It tends to make an inexperienced man think that his patient is not very ill if the symptoms are so much less marked than those which he has been taught to watch. To show that it is not an imaginary danger, I have recently had experience in a case in which I operated and removed a perforated appendix from a man seen the previous evening by a physician who had recommended that no operation should be done, on the grounds that the patient "was feeling better," the pulse was normal, and the temperature only raised one degree.

Another error arises from what one can only regard as an unfortunate necessity; I allude to the necessity for dealing very fully in textbooks with the symptoms of abscess, of general peritonitis, and the various complications which follow acute inflammation of the appendix. I would not have such description curtailed, but I think that stress should also be laid upon the fact that abscesses, peritonitis, etc., *are* complications, and may be prevented. It should be clearly and incessantly pointed out that they are not symptoms of appendicitis, but sure signs that other tissues than the appendix have become involved in consequence of the original mischief having extended beyond the appendix, and when that occurs all the symptoms of pure appendicitis become obscured by the graver symptoms of the complicating lesion.

Except in the case of those patients who call in the help of a medical man after complications, such as an abscess, have developed, all patients with diagnosed acute appendicitis should have the appendix removed before there is time for such complications to arise.

Unless one sees the extraordinarily advanced stage of inflammation, and even of sloughing, which the appendix may reach in cases in which the patient shows no outward evidence of any serious lesion, one cannot appreciate the danger that must inevitably attend expectant treatment. I have seen many cases in which the appendix was either perforated or gangrenous, and yet the patients have not looked ill, others in which the temperature and pulse were normal, and one in which the patient, in order to demonstrate to me that I had made a mistake in advising an immediate operation, "punched" himself in the abdomen directly over the region from which in an hour was removed a perforated appendix which had already given rise to an abscess.

I believe that it is possible to avoid disasters by the application of a few clinical rules which I have used for many years.

DIAGNOSIS.

In a *typical* case of appendicitis the symptoms are as follows: The patient has a sudden attack of abdominal pain, before long he vomits, and in the course of a few hours the pain becomes localized in the right iliac region. He looks ill, and therefore a doctor is called in. When the doctor arrives, he hears that history, and he himself observes, first, that the patient has an anxious expression —"sunken-eyed" or "drawn." Secondly, there is some rigidity of the whole abdomen, but the rigidity is most marked in the right iliac region, in which, on pressure, tenderness is found. Thirdly, the temperature is elevated a little—rarely more than one or two degrees. Fourthly, the pulse-rate is accelerated to about 90 beats per minute.

He only *hears* about the manner of the onset, of the epigastric pain, the vomiting, and why he was sent for. What he *observes* is:

1. The general appearance and expression.
2. The rigidity and local tenderness.
3. The temperature.
4. The pulse-rate.

The value of the observations may be small in themselves, but when taken in conjunction with the history they are of the greatest importance. Similarly, the history, when taken by itself and without observation of other symptoms, may not be enough to justify a diagnosis. It is the combination and association of the two which is of importance.

1. *General Expression.*—The fact that a patient looks perfectly well is not a reason for thinking that there is not acute appendicitis. The "sunken-eyed" expression, when present, is indicative of a very acute attack, but its absence does not necessarily mean the contrary.

2. *Local Tenderness and Rigidity.*—Rigidity may be so extreme as to make it impossible to ascertain whether there is any tenderness of the appendix. The rigidity may also be as marked on the left side as on the right. On the other hand, it may be altogether absent, even in cases in which the appendix is gangrenous. Tenderness of the appendix itself is the most important symptom of all. Much of the difficulty in diagnosis is due to the fact that the appendix does not always lie in the same situation. It may be found up against the gall bladder, or even in the left iliac region. It may be wholly in the true pelvis or hidden behind the caecum. Frequently only part of the organ is acutely inflamed, and in such cases the tender point varies greatly, according to whether the proximal or the distal portion is the part affected. In the former case tenderness is usually in the right iliac fossa, whilst in the latter it may be scarcely ascertainable, because the tip of the appendix is almost out of reach, low down in the pelvis. Without tenderness of the appendix it is impossible to arrive at a sure diagnosis. The amount of tenderness varies greatly with the position in which the appendix lies. If it lies in the iliac fossa, with a resisting background, then tenderness is easily elicited, but if it lies over the pelvic brim, pressure upon the appendix is warded off by soft structures, and the tenderness may be so slight as to be overlooked. This is a common cause of mistake in diagnosis or of delay in arriving at a diagnosis, especially as little or no help is derived from a rectal examination in such cases. A localized abscess or a localized peritonitis can be discovered by examining the pelvis per rectum, but rarely an acutely inflamed appendix which has not given rise to such complications.

3. *The Temperature.*—This is a very variable symptom. It may be normal or it may range even to 105°. It is rare to find the temperature more than 102°. Between 99° and 101° is that usually met. It is of all symptoms the least to be relied on, inasmuch as it is commonly expected and frequently absent. If elevation of temperature is present it helps to confirm the diagnosis, but the fact that it is normal never warrants the opinion that therefore the appendix is not acutely inflamed.

4. *The Pulse-rate.*—This also is a symptom which, in the early stages of appendicitis, is not of importance. If the temperature is raised the pulse will rise in proportion. It is in the later stages that the pulse-rate is of the most value as an indication of how things are progressing, but in the early stages the pulse may be unaffected. A few years ago I operated upon a man for acute appendicitis, and six months later upon his son. The father had a pulse of 54 and the son's pulse was 58.

These, then, are the "cardinal symptoms" of acute appendicitis.

Unfortunately, the majority of cases are not as easy of diagnosis as are those which are known as "typical." Let us suppose that a doctor sees a case during the morning; he hears the history of the onset, and he notes the four cardinal symptoms. It is a mild case. What should he do? The wise course to follow, if he is sure of his diagnosis, is to advise the removal of the appendix forthwith; but, if he thinks differently, he should keep the patient in bed, apply hot fomentations to the painful area, and do nothing more. Sips of water may be given, but no food. On no account should morphine be given. If the pain is so severe as imperatively to demand morphine, the case is one for immediate operation, and the drug should only be given on the understanding that an operation is to

follow its administration. In the early stages of acute appendicitis morphine may give the appearance and feeling of perfect well-being to an urgent case, and it should never be given until a decision has been arrived at as to whether or not an operation is necessary. If an operation is not necessary, neither can morphine be. The patient must be seen again in the course of a few hours, and again the cardinal symptoms must be noted.

INDICATIONS FOR OPERATION.

If *all* the symptoms have not improved, or if *any one* of them has become more marked, the inflammation is not subsiding, and it is necessary to remove the appendix.

1. The patient may look well, the local tenderness may be slight, the temperature may be normal, but *if the pulse-rate continues to rise* (a fact to be ascertained by repeated countings) the appendix should be removed.
2. The patient may look well, the local tenderness may be slight, the pulse-rate may be slow, but *if the temperature has risen* the appendix should be removed.
3. The patient may look well and the temperature and pulse may both be normal, but *if the local tenderness has increased* the appendix should be removed.
4. The local tenderness may be slight, the temperature and pulse may both be normal, but *if the patient looks worse* the appendix should be removed.

If, using these rules as a guide, an operation is decided upon, it should be performed without delay. It cannot be right to allow such cases to wait until the following morning, any more than it would be right to allow a strangulated hernia or a ruptured gastric ulcer to wait. It will be noticed that I have only dealt with the symptoms of acute appendicitis itself, and that I have not regarded the symptoms which mark the complications developing in the later stages of the complaint. My object has been to draw attention to what are the symptoms of the initial lesion and to divert attention from symptoms which are produced by avoidable complications. The hope of preventing death from appendicitis can only be fulfilled by our removing the inflamed organ before it has time to infect the peritoneum.

Unfortunately, from one cause or another, either because the patient is first seen by a medical man after complications have arisen, or because an "expectant" line of treatment has been adopted, the majority of cases are operated upon more for the sake of combating complications than in order to prevent them. Of these 619 cases upon which I operated between January, 1900, and December, 1911, 113 were interval cases. Of the remaining 506 cases, 350 had already developed either an abscess or general peritonitis, 299 had abscesses, and 51 had general peritonitis.

The only complication to which I would make particular reference is that of a localized abscess. It is a common belief that it is necessary, before a confident diagnosis can be made, that we should be able to "feel" something in the appendix area. That is a most serious error. It should be generally known that *a "lump" means an abscess.* This, like all similar statements, is not invariably true; but it is so true that, unless some other cause can be assigned for the presence of the palpable swelling, it should in all cases be looked upon as an indication of the presence of pus.

Except in cases in which there is a palpable piece of oedematous omentum or in cases in which the appendix itself can be felt, I know of none to which the rule does not apply: that a palpable swelling which develops in the course of an attack of appendicitis indicates that there is pus—that is, an abscess.

It appears to me to be the duty of any surgeon who has had experience of the ill-effects of expectant treatment to do what he can to counteract it. The principles of expectant treatment are the principles upon which large numbers of the cases which are sent to hospital have been conducted. If it could be shown that expectant treatment had the effect of keeping the lesion localized, nothing more would be necessary to prove that expectant treatment was sound, but the frequency with which general peritonitis develops whilst such treatment is being carried out is enough to condemn it. If we divide all cases into the two classes—those with a localized lesion and those with general peritonitis—and compare the results of operations upon those two classes, we obtain overwhelming proof of the danger that attends general peritonitis. Of my own cases, 506 were acute. Of those, the lesion was localized in 455, and 51 had general septic peritonitis. The difference in the mortality in the two classes is truly appalling, for, whereas in those in which the lesion was localized the death-rate was 3.07 per cent., amongst those in which general peritonitis had developed it was 72.5 per cent.

Deaths from acute appendicitis cannot be abolished by treatment on the expectant principle—it has an acknowledged mortality of 3.3 per cent.—and there does not appear to be much hope of improvement in the results of such treatment. On the other hand, the results of operative treatment afford abundant hope that, granted the cases be seen in good time by a medical man, all may be saved. If we treat the acutely inflamed appendix by operation and do not wait for complications to develop, there is no mortality, but if we treat the complications, some of which are certain to occasionally develop during expectant treatment, by operation the percentage of cases which die steadily increases with the severity of the complications. In this list it will be noticed that there were no deaths amongst the cases in which it was not necessary to drain the wound, but as soon as the necessity for drainage arose there was an attendant mortality, which is another way of saying that some complicating infection of the peritoneum had arisen.

The true surgical treatment of acute appendicitis may be summed up in this: It is the prevention and not the treatment of complications which is our aim.

Though a patient may recover without an operation, he is left with the prospect of another attack. The severity or mildness of an attack gives no sure guide to the seriousness of the lesion. The advocates of the waiting policy advise that the appendix should be removed when the attack has subsided. That, I am sure, is a wise thing to do, provided that, in the case of those who recover from a severe attack, a sufficiently long convalescence be allowed before appendicectomy be undertaken. In the case of those who have recovered from acute appendicitis with an abscess or with general peritonitis, six months is never too long a time. Such advice, however, involves a reply to the question, which must be answered before the parents will consent—namely, What is the likelihood, the patient having recovered from one attack, that another attack will occur? It is not enough to tell the parents that another attack *may* occur. Every one knows that is possible, but every one also knows of many cases in which there has been one attack only without any recurrence for many years afterwards. They wish to know whether it is certain to take place before they will agree to an operation being performed for the prevention of a problematical illness. No man is able to say what that probability is, and until we are in a position to assure people that one attack necessarily involves another they will frequently wait until another attack supervenes. It is not altogether a matter for congratulation when a patient recovers from an attack of appendicitis and still retains the originator of the trouble. He may hope that the feared attack will be as the former one, but it may be fatal.

The method of operating which I employ is by an oblique incision parallel to the crest of the ilium, and of such length as the case requires. In "interval" cases the incision is usually 4 or 5 in. long, and I never employ the muscle-splitting method, because it requires one to operate in a hole without a sufficient view. In abscess cases I avoid, if possible, division of the epigastric vessels and opening of the sheath of the rectus muscle. The incision is extended into the flank, sometimes a long way, and this has the double advantage of giving an excellent view and of affording good drainage. I generally use both a gauze and a rubber drain, which are brought out through the posterior extremity of the wound. The stump of the appendix is clamped, ligatured with catgut, and tucked in with a catgut purse-string suture.

I would not have it thought that I regard the diagnosis of acute appendicitis as free from difficulty. I am fully

alive to the immense difficulty that there is in many cases—so great as to make a sure diagnosis in some cases impossible, especially in stout people and in pregnant women. In the majority of instances, however, it is not because a diagnosis has not been made, but rather because, having been made, it has not been acted upon, that so many cases come to the surgeon with complications.

SPONTANEOUS REDUCTION OF INTUSSUSCEPTION.

BY

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SPONTANEOUS reduction of an intussusception in infancy is admitted by the textbooks to be a possibility, though stated to be a very rare occurrence. There is an obvious difficulty in forming a definite opinion on this point in that the proof of such a happy ending is necessarily absent owing to the disappearance of the intussusception. Until quite recently I have never seen any real amelioration of symptoms in this disease unless relieved by operative interference, but the following case upon retrospective study would appear to be a genuine exception to the usual course of events.

J. B., male, aged 13 months, previously healthy, with no history of intestinal disturbance. He was present at a juvenile tea party on April 8th, and, in the absence of his mother, was given quantities of unsuitable food and whole strawberry jam. He passed a restless night, and next morning had some diarrhoea. On the same day I was urgently sent for at 2 p.m., and was told that the child had been seized with frequent and violent attacks of abdominal colic, several of which had been so severe that he had literally stood on his head, boring into the pillow and screaming out with pain. The diarrhoea continued, the stools being thin and offensive and accompanied by a quantity of mucus, but no blood. There had been no vomiting.

The child was white, restless, not intensely collapsed, but with a small, quick pulse, and a marked expression of abdominal distress; every few minutes he obviously had abdominal pain. The abdomen was hard and resistant, a little distended, and everywhere highly resonant. No tumour was felt and the rectum was empty. This examination being highly unsatisfactory owing to rigidity, and it being very desirable to make a diagnosis, if possible, I returned at 4 p.m. with my partner to give an anesthetic in the hope of settling the question. I found the child very much better, with lessening pain, returning colour, and an improved pulse. It was decided that an intussusception was improbable, and an anaesthetic was not given, it being determined to watch the child closely. The improvement was maintained, and in the course of a few days on a rigid diet with the cautious use of small doses of castor oil, the child recovered his usual health.

Some six weeks later, on May 21st, a similar attack took place, of corresponding severity, but on this occasion there was no diarrhoea, only a little blood and mucus being discharged from the bowel. There was no vomiting, and again no tumour could be felt in the rectum or abdomen. With the history of the former attack in one's mind and the recovery therefrom, and with the child close at hand under immediate observation, it seemed justifiable to again adopt expectant treatment. This was again attended by success. The bowels were opened with difficulty, the stools being constipated, but free from blood, and the abdominal pains disappeared, except at very rare intervals.

All went well for five days. On May 26th I received again an urgent message to see the child, whom the parents thought to be dying. This time the clinical picture of acute intussusception was to be read in the child's appearance. The collapse was of that degree of profundity which is associated with this lesion in infancy and which once seen is never forgotten. The child lay motionless, colourless, hollow-eyed, and apparently moribund, the recurring abdominal pains momentarily restoring the appearance of life. All this was well within an hour from the first onset. Blood and mucus had again been passed, and vomiting had commenced. The child was at once taken to a nursing home. On opening the abdomen some hour and a half later a little clear serous fluid escaped. A quite recent intussusception, some seven or eight inches in length, was found in the left iliac fossa, which I had no difficulty in reducing. It was apparently of the ileo-caecal variety. The abdomen was rapidly closed ith through and through sutures of one layer only, and the patient returned to bed certainly much better than before the operation. The after-history was uneventful and the recovery uninterrupted, small doses of opium (tinct. camphorae co., m v) being freely used for the first three days.

The presence of a congenital umbilical hernia did not lessen the difficulties of diagnosis in the first two attacks. This was always reducible, but the possibility that a small piece of omentum might be nipped had to be borne in mind. The hernia was not interfered with at the operation, but curiously enough it has not reappeared, the empty flaccid sac lying on the abdominal wall.

My personal conviction is that the first two attacks were undoubtedly due to the commencement of an intussusception, which in each case was spontaneously reduced—completely so in the first attack, perhaps incompletely in the second, in spite of the fact that reduction at the operation was easily effected, and that the intussusception appeared to be a recent one.

The third attack alone showed the full degree of collapse which one is accustomed to expect, but there can be no doubt that this degree depends upon (*a*) the length of bowel involved, and (*b*) the amount of tension and compression of the mesentery.

A CASE OF FRACTURED PELVIS COMPLICATED BY LACERATION OF THE FEMORAL VEIN TREATED BY LATERAL VEIN SUTURE.

BY

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THE following case possessed characteristics which were deemed worthy of report:

J. C., a clerk, aged 35, was admitted to the Manchester Royal Infirmary with a history that he had been jammed between a lorry and a gate post at a railway station goods yard. The strain was apparently slightly oblique from right to left and oblique from before backwards.

The patient stated that on freeing himself he walked thirty yards or so; he was then seized with acute pain in the right groin and collapsed.

Condition on Admission.—The patient, who was admitted one hour after the accident, was a well-built man, but looked anaemic and ill. Respirations were quick and sighing, and he was very restless though fully conscious; the pulse was 120 and thin; the temperature was 97° F.

On inspecting the abdomen and groins a large swelling about the size of a melon was seen, filling up and mapping out Scarpa's triangle on the right side. The integument over this was of a mottled purple colour. The swelling was non-expansile, soft, and fluctuant. It had a feeling as if there was very little tension in the tumour, and was tender. The pulse could be felt perfectly well in the posterior tibial artery at the ankle, and was also quite palpable in the popliteal space. There was a slight impulse on coughing and straining. On jarring the crests of the ilia there was exquisite pain. Rectal examination revealed great tenderness and a bony prominence in the region of the pubic crest on the right side. The abdomen moved well on respiration, was soft, and not tender, and was resonant in the flanks. A soft Jaques catheter was passed, and 12 oz. of normal urine drawn off.

Diagnosis.

The history of the accident, the rapidity with which the swelling had appeared, and the fluctuant feel of the tumour led one to a diagnosis of haematoma. The absence of expansile impulse, the presence of the pulse at the ankle, the soft non-tense feel of the tumour made it most probable that it was of venous rather than arterial origin. The results of the rectal examination and the great pain on jarring the hips showed that the pelvis was fractured.

Operation.

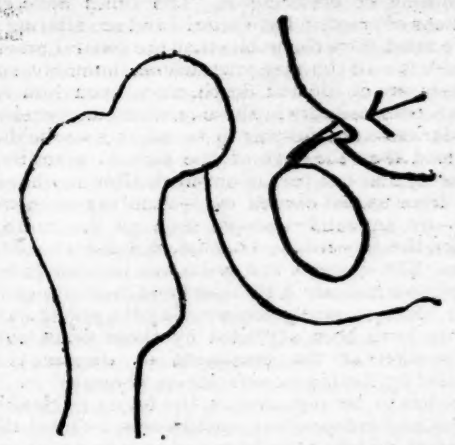
The man's condition was so urgent that the resident surgical officer, Mr. Howard Buck. F.R.C.S., decided on immediate operation.

A longitudinal incision about 4 in. long was made over the tumour. On cutting through the integument and deep fascia, dark clots and about a pint of dark fluid blood were turned out. On exposing the femoral vein, it was seen that a sharp spicule of bone broken away from the pubic crest had penetrated the vessel just as it came under Poupart's ligament. The tear in the vein was longitudinal and about ¼ in. in length. Further haemorrhage was controlled by digital pressure below the laceration. The vein was repaired by lateral phleborrhaphy, a Lembert suture of fine thread being inserted with a domestic needle. The spicule of bone was removed and a tube with gauze packed tightly round inserted into the cavity. Towards the end of the operation the patient's condition became critical, and about 4 pints of normal saline were infused into the median basilic vein.

After-History.

The tube and gauze were removed on the third day after operation, and the patient lay between sandbags with a tight binder over the pelvis for a month. He was then discharged, and was able to walk from the ward. There was never throughout the convalescence any swelling or oedema of the limb, which remained quite painless. It is therefore most probable that at no time was there any venous thrombosis of any extent.

An *x*-ray photograph taken a week after operation showed a flake of bone torn away from the pubic crest to about ½ in. from the pubic spine. The diagram shows the condition.



Arrow denotes point of fracture and spicule of bone. (Drawn from actual skiagram.)

Although laceration of the femoral vessels is a well recognized complication of fractured pelvis there are few, if any, cases on record; certainly none treated in this manner with success. The interesting physical signs in this case making it possible to differentiate the venous haemorrhage from arterial were very striking, as also the complete absence of venous complications after vein suture.

Lejars states that there have been several successful cases of suture of vein trunks reported. Out of six of the inferior vena cava there were four successes and two deaths. Jacobsthal has collected 53 cases of suture of large veins; in two only of these did lateral suture fail.

It is thus evident that a large vein such as the femoral should always be given a chance by suture rather than resorting at once to ligature, as the results of femoral vein thrombosis are so often unfortunate, to say the least. In cases in which lateral ligature (partial) can be carried out suturing can in nearly all cases replace it, and the chances of secondary haemorrhage are said to be less than in lateral ligature. In infected wounds or veins injured by sepsis suture is useless.

Lejars recommends round needles as used in the above case, and sutures of sterilized thread soaked in aseptic vaseline. He is against a Lembert suture being inserted, and always does a through-and-through suture. It is quite evident that if a Lembert suture is possible it is preferable.

My thanks are due to Mr. A. H. Burgess, F.R.C.S., and Mr. H. Buck, F.R.C.S., for permission to report these notes.

THE seventh Congress of Austrian Balneologists will be held at Meran in October (11th to 13th). Numerous papers have been promised not only from Austria, but from Hungary, Germany, and Switzerland. A special feature will be a formal tribute of acknowledgement of the work of Professor Winternitz, who has for many years been President of the Austrian Balneology Society. Communications relative to the Congress should be addressed to Dr. von Aufschneiter, Baden bei Wien.

REFLECTIONS AFTER TWENTY-ONE YEARS OF GENERAL PRACTICE.*

By F. W. JOLLYE, M.D., F.R.C.S.,
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DANTE says that "all men are delighted to look back," and it is as well that it is so, for only by that means are we able to think over our experiences—successes and failures—and see how they can help us to steer a course in the future which shall not only increase the unity and concord among ourselves but also our power to lessen the sorrows and the average sum of human suffering. Never was the general practitioner better fitted by his training to undertake the treatment of disease, and never has he shown more than in the past few years, by his readiness to help on the work of preventive medicine, by his whole-hearted support of public health measures, that he is not here to get all he can out of life for himself, but to try and make the lives of others happier. And, although he is better qualified in every way to treat disease than he was, say, twenty years ago—owing chiefly to his greater knowledge of the cause of it—yet his responsibilities and anxieties have multiplied considerably without any corresponding acknowledgement by the public that his increased efficiency is worthy of better recognition. During the last twelve months the general practitioner has been passing through the most momentous times of this or any other age, and one has only to read the letters that have been published in the daily papers to see that our prospects are gloomy unless we fight shoulder to shoulder. We were all told at that very dull entertainment called the opening of the winter session that we were entering a noble profession, and ever since that blessed word "noble" has so rung in our ears that we seem as a body to have been quite mesmerized by it. Noble to suffering humanity we have been, and always shall be in the future, but have we shown by our loyal co-operation with each other the same nobleness of character? Have we not rather by our want of unity allowed ourselves to be at first cajoled and then threatened with ruin and disaster by self-seeking politicians, until at last we have realized that we must fight for principle and justice, cling to our ideal, and take hope in the remembrance that sometimes "from our desolation only does the better life begin." If we only reflect for a moment that medicine is the only world-wide profession following everywhere the same methods, actuated by the same ambition and pursuing the same end, it must seem to us all that it is only the want of unity, peace, and concord amongst ourselves that is responsible for the treatment meted out to us by certain sections of the community. During the last few months many men who for years stood aloof from the British Medical Association have come into the fold, having at last realized that the old maxim, "United we stand, divided we fall," is as true of the medical profession in its dealings with the public as it is of any other walk in life.

The protest made by some members of the profession, that we are forming ourselves into a trades union, seems, to say the least of it, illogical, for, while believing that each member taken individually is prompted by the highest ideal, they believe that when banded into a compact mass they are actuated by baser motives. Unless the majority of medical men are tradesmen, it is impossible to create a medical trades union. A union of professional men will be a professional union, and the more perfect the union the more possible it will be to maintain in each of its units the highest traditions of our calling. We object to being treated as tradesmen, as if our only duty is to supply all owners with a bottle of medicine or liniment, very much as goods are supplied across the counter at a co-operative store, all the finer and scientific work which has been built up during the last fifty years being totally ignored or sacrificed to the cry for the "cheap doctor." It is to be hoped that all who have lately joined the Association will attend the meetings of our Branches and Divisions as frequently as possible, for by so doing they will not only increase their educational value, but help to promote that unity and friendship amongst the

*Being the Presidential address delivered before the Southern Branch of the British Medical Association.

members which is so very essential to the dignity and usefulness of the profession. As Sir William Osler says, "Unity and friendship, how we all long for them, but how difficult to attain! Strife seems to be the very life of the practitioner, whose warfare is incessant against disease, ignorance, and prejudice, and, sad to have to admit it, he too often lets his angry passion rise against his professional brother." The medical meetings come in here as a professional cement, and in a friendly, social way lead to a free and open discussion of differences in a spirit that refuses to recognize diversities of opinion in the non-essentials of life as a cause of personal animosity and ill-feeling. But not only do these gatherings promote professional social intercourse, but they continue our post-graduate education and culture, for even in populous districts the practice of medicine is a lonely road which winds uphill all the way, making it difficult to escape the malign influences of a routine life and of work in a narrow field.

Many of us looking back must regret the want of a more liberal education, for a little more classical reading would have taught many of us that even in the ancient days there were two classes of practitioners who were supposed to treat their patients very differently according as to whether they were club or private patients, and who were consequently held in very different esteem by the public. Plato in one of his dialogues refers to the two sorts of doctors:

> The slave doctors run about and cure the slaves or wait for them in the dispensaries; practitioners of this sort never talk to their patients individually or let them talk about their own individual complaints. The slave doctor prescribes what mere experience suggests, as if he had exact knowledge, and when he has given his orders like a tyrant, he makes off with equal assurance to some other servant who is ill, and so he relieves the master of the house of the care of his invalid slaves. But the other doctor, who is a freeman, attends and practises upon freemen: he carries his inquiries far back, and goes into the nature of the disorder, he enters into discourse with the patient and with his friends, thus at the same time getting information from the sick man and also instructing him as far as he is able, and he will not prescribe for him until he has first convinced him; at last, when he has more and more brought the patient under his persuasive influence, and set him on the road to health, he attempts to effect a cure. Now which is the better way of proceeding in a physician and a trainer? Is he better who accomplishes his end in a double way, or he who works in one way, and that the rude and inferior?

It seems almost impossible that if we had read this and many similar passages from the classics in our youthful days we should have been for the last twelve months fighting the battle of the freeman doctor against enemies amongst whom we number some of our professional brothers, who seem to think that sufferance is the badge of all our tribe, and that the work we commenced fifty years ago in semi-charity should now be forced upon us, willy-nilly, at the point of the bayonet.

Looking back only the last twenty-one years one cannot help being impressed with the enormous improvement made in the lot of the working man, and how vastly enhanced is his wage-earning capacity, brought about by the agency of his powerful unions. Yet we, with our increased expenses both in our hospital training and in carrying on our practices, to say nothing of our increased efficiency in dealing with disease, are, I say without hesitation, taking lower fees than we were twenty years ago. And why? Because we have not the pluck to demand proper remuneration from those who can well afford it. I will give you an example from my own experience. I have had, as no doubt most of you here have had, letters from insurance companies running somewhat as follows: "Please examine Mr. So-and-so, and fill in the enclosed form under the Workmen's Insurance Act. On receipt of your reply we shall be pleased to forward you our usual fee of half a guinea." I have always answered that my usual fee is a guinea, and that I should be pleased to fill in the form on receipt of that amount. I have always received a satisfactory reply, with one exception, when I was informed that half a guinea was the fee considered satisfactory by many of the highest in the profession, and that it ought to satisfy me. To this I replied that I knew nothing about the highest in the profession, except that I had sometimes helped them to get their fees, but that they had never helped me to get mine, and I returned their form for some one else to fill up. Needless to say, I got it back with my guinea enclosed.

How much is lost in fees annually by the profession no one can calculate, but it must be very large, and I put it down mainly to two facts:

1. Because we let the public teach us what our fees ought to be, instead of our educating them; and
2. Which is even worse, so many of us, rightly or wrongly, are afraid that we shall not be supported by our own colleagues.

That there is a good deal of truth in the last statement can be gathered from the fact that you practically always hear of neighbouring practitioners being described by the public as opponents, never as colleagues or friends; we are only the latter when we are on a hospital staff and doing gratuitous work.

I know the business side of our professional life is very distasteful to most of us, but that is no excuse why we should neglect it under the veil of charity, which, although perhaps soothing to our conscience, will not take the place of our first duty—making provision for our old age and those dependent upon us.

Again, our education must be kept up to date, and often a man starts with a total misconception of the prolonged struggle necessary to keep the education that he has, to say nothing of bettering it. The times have changed, conditions of practice have altered and are altering rapidly, and we must show the public that the general practitioner, as of old, is still the man with whom, humanly speaking, are the issues of life and death, since upon him falls the grievous responsibility in those terrible emergencies which bring darkness and despair to so many households. It is often said that the days of the general practitioner are numbered, that one part of our work after another is being taken from us and carried out—some say even as effectually—by unqualified people such as the midwife, the optician, the prescribing chemist, and the wholesale drug houses. The specious and seductive pamphlets sent out by the latter indicate a thraldom and credulity of the profession which is hardly surpassed by the public itself. For years we have been exploited by these firms, so that a large section of the treatment of disease is to-day controlled by the big manufacturing pharmacists.

If we are to be regarded in the future as clear-headed, cautious, and independent practitioners we must throw off the fetters which have been forged around us, and not trust so much to the free-gratis Christmas visiting list so thoughtfully presented to us annually by some firms to save us the trouble of thinking out our own prescriptions, and to draw their net more closely around us. The specialists, who are ever increasing in number, we are often reminded, will eventually swamp us; but, putting aside for a minute the question of severe surgical cases requiring operation, the point whether they do or do not rests to a great extent in our own hands; for while we realize that it is the specialist and members of our hospital staffs who must lay down the indication—and what is, perhaps, even of more importance, the contraindication—of treatment, we as general practitioners should not play a too passive part; but after carefully following the practice of our hospitals, and having made ourselves familiar with the medical literature of the day, should be prepared to express our opinion whether any line of treatment should remain a common object of practice, or be confined exclusively to the consulting-room of the specialist. During the last few years we have advanced firmly along a new road in the treatment of disease, due to specific micro-organisms, with the toxic products of which we are learning to cope successfully. The treatment with antitoxins and vaccines bears out the truth of the old maxim of Celsus: "He will treat the disease properly whom the first origin of the cause has not deceived." Upon the general practitioner in the future will fall the duty of treating cases by these specific remedies, and, if we are to hold our own, we must not shy at "specific treatment," which, because it is specific, allows of no routine prescription and application. To take the case of the diagnosis and treatment of pulmonary tuberculosis. After the sorrowful experience of the tuberculin incident of 1890 and 1891, with its unenlightened and mistaken method of administration, it certainly seemed advisable to leave this remedy in the hands of those specially concerned with tuberculosis, but now that the specific diagnosis and treatment of the disease has been accurately investigated and its value and freedom from risk are well recognized and its contraindications fairly evident, the treatment

ought to be recommended as a suitable one to be carried out by the family doctor. If we aim at mastering tuberculosis, no matter by what means, it must in the future become and remain, as will the chief work in stamping out infectious diseases of all kinds, the domain of the general practitioner. By the aid of tuberculin he will enable his patient to reach the sanatorium—if that is considered necessary—in good time, and in case he be obliged to leave too soon, would, thanks to the same after-treatment, stand a much better chance of being cured. We shall constantly miss early cases and diagnose others wrongly if the last and keenest diagnostic agent—tuberculin—in one way or another is not used and its results compared with our clinical observations. This must be so, for sanatorium physicians tell us that 50 per cent. of the patients admitted are in the second or third stage, and nearly 6 per cent. are not tuberculous at all. Want of clearness on the part of the practitioner is far more often responsible for the incurable cases than the patient's neglect to consult a doctor in time; this is greatly to be deplored, because it is the severe cases which, up to now, have formed an inexhaustible source of ever-fresh infection. I need only add that in many cases the test is unnecessary and in others superfluous and harmful, and that, like the *x* rays, these methods of specific diagnosis are not designed to replace but to supplement other approved methods of physical diagnosis and to enter the field when they fail. Unless we always bear this in mind, we are very apt to become what has been called "test-tube" diagnosticians; failing to use our hands and eyes, as our predecessors did, we shall be liable to lose our powers of observation, and be continually trusting to the clinical laboratory to put us right and to suggest the treatment. That the old methods of diagnosis are liable to be neglected, and too much reliance placed on the newer and more fashionable remedies without a sufficient examination of the case, is only too plainly seen by the recent epidemic of vaccine injections for chronic nasal catarrh, which have often been undertaken when the only cure was by surgical operation for the removal of polypi, straightening a deviating septum or other obstruction, which was causing a chronic naso-pharyngeal congestion.

Last year we had a most excellent address by our late President, Mr. Childe, "On Some Warrantable Intrusions of the Surgeon into the Abdomen." I think all who heard it or have since read it will heartily agree with his conclusions as to the necessity of the surgeon being called in in consultation very much earlier than he used to be, even though it be to similar cases that from time to time the general practitioner has pulled out of the jaws of death—more from good luck very often than anything else—without his aid. It has been said that the surgeon lives on the failures of the physician, and one object in the future will be, with the increased help of organotherapy and vaccines to reduce these failures to a minimum. Who knows but that oral and intestinal autointoxication, for instance, which seems to be answerable for many ills, will have been placed during our lifetime on a scientific basis, that each poison will be readily detected and its correct antidote immediately injected? Intestinal stasis and its sequelae, whether they be rheumatoid arthritis, tuberculous joint disease, or disease of the gall bladder, from simple cholecystitis to typhoid infection before the formation of gall stones, will be taken out of the hands of the surgeon, and we shall hear no more of ileo-colostomies and extirpation of the colon. Until that happy day arrives we shall have to go on perfecting our diagnosis, and by that means prevent many of those calamities, especially in abdominal cases, which we have all witnessed. That those calamities are often only the terminal episode of a chronic disease which may have been under medical treatment for a long time—perhaps only off and on—makes the tragedy, when it does come, so much the greater.

If I were asked in what particular it is the most necessary that the practitioner of the future should increase his skill, I should say, without hesitation, in diagnosis, especially the diagnosis of cases in their early stages. The cardinal symptoms of an intussusception, for instance, we were told, were the presence of a sausage-shaped tumour and the passage of blood per anum, and so they are in a fully developed case. But there is an earlier stage when the chief symptoms are a flatness and loss of resonance in the right iliac fossa due to the absence of the caecum. The tumour in its earliest stage is round, and only becomes sausage-shaped later, when it has advanced far enough to cause a drag upon the mesentery, and if we pass a finger into the rectum we shall withdraw it covered with blood and mucus some hours before it is passed externally. The child operated upon in this stage will have a much better chance of recovery than if we wait until the late symptoms are evident. Diagnosis, not drugging, will be our chief weapon of offence against the ignorance and quackery of the masses, which seems to increase *pari passu* with civilization. Long courses of treatment when treatment is useless, as Sir William Osler has pointed out, lead to the misapplication of remedies, and so directly to that lack of confidence in our methods which is apt to place us, in the eyes of the public, on a level with empirics and quacks. At the present time, thanks chiefly to the surgeon, who has thrown light into obscure places, we have opportunities during his manipulations, especially within the abdomen, to see not only the parts immediately concerned in the operation but other organs which are exposed to scrutiny, and a new pathology has arisen, well named by Sir Berkeley Moynihan "the pathology of the living"; and it is the facts based on this pathology, upsetting as they are to our preconceived ideas, which will have to be grasped by the general practitioner if he is to attain to that better diagnosis, followed up by prompt and rational treatment. A *post-mortem* examination, if we have a reliable history of the illness, may be most instructive, but we only see that he died from a far-advanced pathological change which is quite irremediable. How different will be the pathology of the future—that of the living—when we shall be able to know the pathological conditions in the early stages which are causing the patient's sufferings, and straightway proceed to remove them. This new pathology has already told us—only to mention a few fresh facts—that duodenal ulcer is quite as common as, if not commoner than, the gastric form; that a pathological lesion in the right iliac fossa is one of the frequent causes of symptoms of ulceration of the stomach, even although hematemesis is present; that a gall stone in the common bile duct has not jaundice as its cardinal symptom, and is much more frequent than used to be thought to be the case when we had only the pathology of the dead to guide us. At the present time there is just commencing another method of studying the pathology of the living—I refer to the administration of bismuth meals, and by means of the *x* rays watching its progress through the stomach and intestinal tract. The pathology of many obscure cases of so-called dyspepsia, we must hope, will be by this method of examination put upon a surer foundation, and as it can be applied in any position, we may in the future be able to explain why some patients lose their pain while in bed, only to have it return on their getting about again.

Very often there is difficulty, both in medical and surgical practice, in getting at the root of the evil—it is so very easy to mistake secondary effects for the primary cause—and if this new combination of bismuth meals and *x* rays can help us to decide whether to attack the digestive tract at its top near the stomach or at the junction of the small and large intestine below, a great advance will have been made both in the medical and surgical treatment of the digestive system. If the general practitioner wishes to study this new pathology he will have to follow his patient as often as possible to the operating theatre, and in my opinion it is only the cordial co-operation of the hospital staff and the medical men in the neighbourhood that will prevent much of the knowledge gained at first hand being wasted. It requires sometimes a certain amount of courage to send a patient, at perhaps our first visit, some miles into hospital, often at great trouble and expense, with the view of an urgent operation being performed, when we have only probability to support our diagnosis. Bishop Butler has said that "probability is the guide of life," and this is more true of medicine than other professions. We have to act on probabilities in diagnosis very often, and the older one gets the less dogmatic are we inclined to become. Dame Nature seems to be kind and considerate to the young practitioner, and does her best to cover up his mistakes—in more senses than one.

There are two remarks I should like to make concerning county hospitals and similar institutions from the general practitioner's point of view: First, that it ought to be an

understood thing that no member of the honorary staff accept contract work, such as club and Poor Law, but in return for his experience and advertisement—a perfectly legitimate one—he should, if in general practice, demand a rather higher fee than those without such an appointment; in fact, should be more or less a local consultant whom we could call in, in perfect confidence that he is not competing with us on the same basis of fees as our own. Having more time for hospital work, he would be able to increase greatly his powers as a diagnostician. It is in that capacity we chiefly want him to give us a helping hand; for experience is sometimes fallacious and judgement difficult, and we want a surgeon who does not always require to look inside before he can tell us whether it is a case for operation or not. Many a man becomes a good operator with practice, but the art of diagnosis is a much more difficult one to attain, unless one has the advantages of a hospital appointment and plenty of time to devote to it. My second remark is respecting the out-patient department — the ordinary medical and surgical part of it. For many years there has been great dissatisfaction about it, partly because it is overcrowded and sufficient time cannot be devoted to the individual cases, and partly to the abuse of it by people who could well afford the small fee of their own medical attendant. In these enlightened days, when drugging is considered in many cases to be quite a subsidiary part of the treatment and more importance is attached to the prescribing of a proper dietary, to the methods of living generally, and to the housing and sanitary surroundings of the patient, does it not seem evident that this treatment would be much better carried out by their own medical attendant, by whom all these details could be investigated, and whose personal supervision would ensure all orders being more thoroughly carried out? Looked at from this point of view, I think the out-patient department ought to be shut down, and, using Sampson Gamgee's phrase, "turned into the poor man's consulting-room."

There are other points which one could have touched upon concerning our outlook for the future, but I am afraid I must have already wearied you. Let me conclude with a paraphrase of the words of Sir Thomas Browne:

> If a man does not sell his soul, if he does not part with his birthright of independence for a mess of pottage to the Ishmaelites, who harass our borders with their clubs and oppress us with their exactions, if he can only keep free, the conditions of practice are nowhere incompatible with St. Paul's noble Christian or Aristotle's true gentleman.

STERILIZATION OF THE SKIN BY SPIRITUOUS SOLUTION OF MERCURY PERCHLORIDE.

BY

COLIN CLARKE, F.R.C.S., M.B.,

CAPTAIN, R.A.M.C.

SIMPLICITY is the great advantage of the iodine method of sterilizing the skin, but iodine has certain disadvantages. A solution painted upon the scrotum, the anus, or the vulva causes considerable local inflammation, and the patient often suffers pain and discomfort for hours after the operation. Iodine stains all towels and clothing it comes in contact with, and the irritating vapour given off as the solution dries on the skin is most annoying to the operator.

Mercury perchloride in methylated spirit (strength 1 in 500) is a more powerful antiseptic than tincture of iodine, and has practically none of its disadvantages. It can be painted all over the penis, scrotum, anus, etc., and causes only a slight burning sensation when first applied. It can be freely used, and no local inflammation results as long as the spirit is allowed to evaporate. A small superficial burn, however, is caused by the spirit solution if a swab or towel soaked with it is left in contact with the patient's skin during the operation. This can easily be avoided. The perchloride solution does not stain clothing or towels, and no irritating vapour is given off as it dries on the skin. As an antiseptic the perchloride solution is very efficient, and no preparatory dressing of the skin is required before the operation.

The actual sterilization of the skin is very simple. The skin is painted or swabbed over twice with spirit and perchloride solution immediately before the commencement of the operation.

Method.

1. A hot bath and a shave, if necessary, the day before the operation.
2. When the patient is placed on the operating table the skin in the operation area is freely painted with the (1 in 500) spirit solution.
3. A sterile towel is then thrown over the skin and the patient anaesthetized.
4. Ten minutes after the first application of perchloride in spirit the sterile towel is removed, and the spirit solution is again swabbed all over the skin area for about one minute. The skin is now sterile and the operation can be commenced.

If the spirit solution has been applied to the scrotum a final swab over with watery lotion is advisable, for any excess of spirit solution left between the scrotum and thighs causes a superficial burn.

The accompanying list is a record of 102 operations performed without any preparatory dressing. The skin in each case was sterilized when the patient was placed on the operating table.

Seven of the appendicitis cases, marked (*a*) on the list, were of the suppurative or gangrenous variety. After removal of the appendix the peritoneal cavity was drained, and in these cases the wounds naturally healed by granulation. In all the other cases the wounds healed aseptically, and no case of suppuration occurred.

The cases in Group I were prepared as above described with mercury perchloride in methylated spirit (strength 1 in 500).

The cases recorded in Group II were prepared on the same principle—that is, two applications of antiseptic with an interval of ten minutes just before the commencement of the operation. The reagents, however, were different, the first antiseptic paint being a 5 per cent. solution of iodine in rectified spirit, which ten minutes later was thoroughly swabbed off with a 1 in 500 solution of mercury biniodide in rectified spirit. These reagents, however, are much more expensive. Rectified spirit (hospital price, Malta) costs 3s. 7½d. a pint, whereas methylated spirit, which gave equally good results with mercury perchloride, costs only 3¼d. a pint.

The ten minutes interval mentioned above could not always be accurately observed owing to occasional delays—for example, in the administration of the anaesthetic. However, it was adhered to as closely as possible in each case.

Operations.	Group I.	Group II.	Total.
Varicose veins	4	9	13
Varicocele...	5	9	14
Inguinal hernia	5	5	10
Umbilical hernia	2	0	2
Acute intestinal obstruction	0	1	1
Exploratory laparotomy	1	1	2
(*a*) Appendicitis (abdomen drained) ...	6	1	7
(*b*) Appendicitis (abdomen closed) ...	3	11	14
Internal semilunar cartilage knee ...	0	6	6
Fractured patella (wired)	0	2	2
Fractured femur (wired)	0	1	1
Fractured tibia (wired)	0	1	1
Ganglia and bursae excised	4	3	7
Sebaceous cysts, foreign bodies, etc. ...	9	5	14
Amputation (toes)	3	1	4
Circumcision	2	2	4
	44	58	102

CULTURAL EXPERIMENTS.

The following cultural experiments were undertaken to test the antiseptic power of the perchloride and methylated spirit solution (1 in 500).

Strands of dry, unprepared catgut were soaked in broth cultures of pyogenic organisms for eighteen hours. The in-

fected pieces of catgut were then dipped into the spirit and perchloride solution for ½, 2, 3, or 5 minutes. They were then soaked in sterile water for twenty-four hours to remove the perchloride, and finally cultivated in broth tubes.

Minutes in Spirit Solution:	½	2	3	5
Staphylococcus albus (catgut)	+	−	−	−
Bacillus coli communis (catgut)	+	−	−	−
Staphylococcus aureus (catgut)	−	−	−	−

+ Growth in culture tube; − sterile.

IODINE AS A DRESSING FOR OPERATION WOUNDS.

BY

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My experience of iodine as a first dressing for recent cases of lacerated, and particularly dirty, wounds, having been decidedly happy, and the preparation of cases for operation by the same solution now being my routine practice, I was naturally much interested in the perusal of Mr. Reginald Alcock's address, published in the BRITISH MEDICAL JOURNAL of February 3rd, 1912, on iodine as the sole dressing for operation wounds.

I had already adopted the practice of painting wounds with iodine at the conclusion of the operation before applying the dressings, and had even tried—with much misgiving be it said—leaving them entirely without dressing, especially in children; but it is only during the last two months that I have taken my courage in both hands, with Mr. Alcock's experience to guide me, and in every possible case, both in hospital and private practice, used iodine as the sole dressing, with the most satisfactory results.

It appeared to me that working, as one does, on some of the dirtiest skins possible to imagine—those of the Egyptian fellah—the method would have an opportunity of justifying itself, and proving the claims so eloquently put forward on its behalf; and I must admit at once that it has completely established its position.

Before I began the preparation of operation cases with iodine—a practice which all my colleagues have now adopted—I was accustomed to dress my cases with a piece of sterilized gauze fixed with collodion; but I found that with iodine-prepared catgut the results were not always altogether satisfactory, as some superficial redness or even blistering occurred from time to time, due, I thought, to an antagonism between the collodion and the iodine. I therefore stopped the collodion and substituted ordinary sterilized dressings, but now no dressing, in the ordinary sense of the word, is used at all and the cases do better than ever they did.

The first case in which I employed this method was that of an old woman, on whom I operated for strangulated umbilical hernia. The abdomen having been prepared by painting freely with a 2 per cent. solution of iodine in rectified spirit, the operation was performed in the usual way, a free transverse incision being made in the skin, the sac opened, and a large mass of dark omentum removed. The radical operation was done, and the skin brought together by four deep mattress sutures of silkworm gut, and the edges fixed with Michel's clips. The wound and its surroundings were then thoroughly painted with iodine, and a piece of dressing thrown over it till the patient was taken back to bed. She was at once put in the Fowler's position on a special bed—the operation was done under stovaine anaesthesia—and a cradle placed over her to support the bedclothes, the wound itself being entirely uncovered. It was painted twice a day for the first four days and then once daily for a week, and in spite of the old lady's scratching of the wound and a rather disquieting interest in the mechanism of the clips from time to time, the wound healed absolutely perfectly, the deep sutures being removed in four days, the clips in six, and she was up and about on the tenth day.

Fifty other cases have been treated in much the same way with equally good results. Knowing my patients and their complete ignorance of the veriest elements of cleanliness, I have generally left a piece of dressing lying on the wound, but not fixed in any way, and in some other cases where there seemed to be a prospect of a good deal of oozing—notably in one case of plating an old spiral fracture of the tibia—I have continued the painting with iodine, but have put on some dressing and fixed it with a firm bandage for a few days.

Again, in cases in which it has been necessary to put in a drain, as in removal of the breast for cancer and in tuberculous glands of the neck, a piece of dressing has been placed over the drainage openings, the rest of the wound being entirely exposed and painted with the iodine. They all healed well and continued to go on satisfactorily after the drain was removed and the opening painted like the rest of the wound. Sometimes, also, serum that has accumulated in the wound has been let out by inserting a probe between two clips, but without in any way interfering with the aseptic healing of the entire wound. The iodine does not seem to exert any chemical action on the metal clips.

It would be tedious to record the cases individually, but they include 6 operations for ventral and umbilical hernia, many inguinal hernias (both single and double), several hydroceles, 2 complete removals of breast for cancer, 4 goitres, 2 epitheliomas of lip with removal of glands in the anterior triangle, 4 circumcisions, 1 hare-lip, trephining, amputations of legs, suprapubic lithotomy, plating of fractured tibia, plastic operations for cicatricial contractions after burns, and 2 partial amputations of the hand at the carpo-metacarpal joints for enchondroma and sarcoma. The case we are proudest of is one of double hernia and double hydrocele, in which the patient developed delirium tremens the day following operation, and yet all his wounds healed perfectly without other dressing than the iodine paint.

Only one case in the whole series has gone wrong, and that may, I think, be entirely ascribed to our own stupidity and neglect, and cannot in fairness be considered a failure due to the method under discussion.

It was an extensive operation for softened and suppurating tuberculous glands of the neck, necessitating a very wide dissection. Unfortunately the drainage tube I had ordered to be put in for twenty-four hours was not inserted. The following day there was fever and the cavity had filled up with serum, but, hoping against hope that it might be absorbed, the house-surgeon did not introduce a probe to evacuate it, with the inevitable result that next day when I saw the case during my round the fever was still high, and I then evacuated broken-down blood and pus. Clips had to be removed in two places, and, though the final result was better than might have been expected, it spoilt our run of successes.

Personally I can only blame ourselves and hold the method guiltless, especially as a precisely similar case in the same ward, which had been done a few days before, but had been drained for twenty-four hours, did perfectly.

I would prefer not to dogmatize too strongly on the merits of this method on a comparatively small experience, but tender this contribution as confirmatory evidence of the efficacy, the simplicity, and the economy of a procedure which cannot fail to appeal to hospital surgeons and private, and especially country, practitioners alike.

IODINE AS THE SOLE PREPARATION AND DRESSING FOR OPERATION WOUNDS.

BY

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BEING much interested in the article by Mr. Alcock, F.R.C.S., of Stoke-on-Trent, which appeared in the BRITISH MEDICAL JOURNAL of February 3rd, 1912, on the subject of iodine as the sole dressing for operation wounds, I determined to give it a thorough trial, and have used it in every clean case admitted to my wards for operation, 77 in number, during the three months, February 6th to May 6th, 1912.

After this experience of it at the Royal Naval Hospital, Plymouth, I am so convinced of its efficiency and economy

that I think the following statistics may be of value in advocating its more general use:

Table of Cases Treated by the Open Iodine Method between February 6th and May 6th, 1912.

	No. of Cases.
Hernia, radical cure for	43
Hernia, strangulated	2
Hammer toe	1
Appendicectomy	4
Varicocele	4
Hydrocele	1
Excision of semilunar cartilage of knee-joint	5
Fractures, plated or wired	3
Excision of new growths (non-malignant) ...	3
Varicose veins	5
Bubo	1
Excision of tuberculous cervical glands ...	2
Cystotomy and repair of penile fistula ...	1
Exploratory laparotomy	1
Removal of needle from sole of foot ...	1
Total	77

In the earlier cases in this series, after painting with iodine on the evening before operation, a sterile gauze dressing was bandaged over the operation area and removed on the operation table before the second painting, but in the later cases this dressing was abandoned.

Routine Method.

(*a*) The evening before operation: (1) Shave the operation area; (2) hot bath and thorough drying afterwards; (3) paint the operation area with tincture of iodine.

(*b*) At the operation: (1) Paint operation area with tincture of iodine immediately before making the incision; (2) paint the wound again after insertion of stitches.

(*c*) After-treatment: (1) Paint wound with iodine on second day after operation; (2) paint again on ninth day, after removal of the stitches.

The wound and adjoining skin should be kept as dry as possible during the operation. All blood and discharges should be wiped off at once with dry gauze swabs, as fluid of any sort tends to macerate the outer layers of epithelium and to wash away the iodine from the mouths of sweat glands and hair follicles. It is generally allowed that the infection of an operation wound, the skin of which has been prepared in the usual way with spirit and antiseptic lotions of various kinds, is due to micro-organisms concealed in the mouths of sebaceous ducts, sweat glands, or in hair follicles, which had not been reached by the antiseptic lotions, and it is owing to the penetrative and hardening qualities of tincture of iodine that it is so much superior to any of the older methods for preparing the skin for operation and as the sole after-dressing.

Several of the patients in this series of 77 cases had been previously operated on for various conditions and had had to go through all the strenuous preparation of their skin before operation, and to wear many layers of aseptic dressings and bandages after operation, and have told me that this, to them, new method does away with the chief discomforts attendant on operation. It certainly does away with any anxiety for the operator, as to whether the skin has been properly prepared for operation or not, and it also seems more scientific to seal up any micro-organisms present in the skin during the healing of the wound by means of tincture of iodine, than to encourage them to come out of their lair in sebaceous duct or hair follicle, into the genial warmth produced by a bulky aseptic dressing.

During the three months I have been using it, I only came across one skin that resented iodine—a case of loose bodies in the knee-joint, in which a pustular eruption was produced by a single application of iodine, necessitating postponement of the operation. This occurred in a sick-berth attendant working in the hospital, who was the subject of marked acne, and on whom I operated about six weeks later (when he was cured of his acne) by the iodine method with perfect success. His case is not included in the 77 of this series, as he was operated on after the three months' trial of iodine on which this paper is based.

So far the results in all my cases have been uniformly excellent, and I have yet to see a stitch abscess. The only objection I have seen to the method up to the present is, that in cases where a space is left in the tissues by the removal of a tumour, this space is apt to fill up with serum, which would not happen with a firmly-applied dressing and bandage. This happened in three cases of hernia and one of removal of a fibroid tumour from the great trochanter in this series of cases. It was a matter of no moment. A probe was passed through the wound, the serum let out, and the wound again painted with iodine. The three great advantages of this method of treating wounds are:

1. Its efficiency and simplicity, when compared with any other method of rendering wounds aseptic.
2. The minimum of discomfort to the patient.
3. Its economy, in doing away with at least three sets of sterile dressings, and the time and labour employed in preparing the same.

EIGHTIETH ANNUAL MEETING

OF THE

British Medical Association.

Held in Liverpool on July 19th, 20th, 22nd, 23rd, 24th, 25th, and 26th.

PROCEEDINGS OF SECTIONS.

SECTION OF ANATOMY.

WILLIAM WRIGHT, M.B., D.Sc., F.R.C.S., President.

PRESIDENT'S INTRODUCTORY REMARKS.

PROFESSOR WRIGHT, in opening the meeting, emphasized the interest of the first subject for consideration—namely, the growth of bone, normal and abnormal. The Section was to be congratulated on meeting under favourable auspices, and in having the great advantage of Sir William Macewen's presence, Sir William's contributions to the question being in many ways the most striking since the day of Hunter.

DISCUSSION ON DEVELOPMENT AND GROWTH OF BONE, NORMAL AND ABNORMAL.

OPENING PAPER.

By Sir WILLIAM MACEWEN, F.R.C.S., LL.D., etc.,
Regius Professor of Surgery in the University of Glasgow.

SIR WILLIAM MACEWEN, speaking from notes, gave a summary of the important work on which he had been engaged for some years past and which had recently been issued in book form. He felt that the problem was such a wide one that it was essential to limit the discussion to one more or less definite issue, and he had chosen the more strictly anatomical aspect of bone formation as the most suitable. One evidence of the vastness of the subject was the extraordinary wealth of its literature, a condition which made it impossible for any one doing real research work to even attempt a summary of the literature in the paper embodying his results. It was futile to level it as a criticism of original work that the author did not quote in his writings all the previous papers on the subject. From the anatomical point of view, the osteoblasts were the first subject for investigation. Concerning these cells and their origin very divergent views were held; some believed that they were cells which had nothing to do with the pre-existing cartilage cells, but his researches had led him to the very definite conclusion that the cartilage cells themselves became osteoblasts. He believed the osteoblast was derived from a cartilage cell, that cartilage was always present potentially in bone even when mature, and that when repair took place the development of cartilage preceded the formation of bone. In the change from cartilage cell to osteoblast the cell capsule disappeared, and he asked the pertinent question, If cartilage does not produce bone, what is the use of it? In rickets, too, the projections which occurred in long bones like the tibia were preformed in cartilage and subsequently became converted into bone. In some cases, however, cartilage did not appear, and the osteoblast seemed to develop from bone direct. It was certain, however, that old bone could produce cartilage, or to put it in other words, cartilage was a phase in the

reproduction of bone. By means of lantern slides, the speaker showed how he had carried out experiments to prove his statements. For example, after removal of a piece of a long bone in a young animal there was a rapid filling up of the space by fresh bone, from which it had been argued that the new bone was the result of the activity of the periosteum. This, however, the speaker regarded as a mistake, and to prove it he removed the whole of a long bone, leaving the periosteum intact, and even after the lapse of six weeks no reproduction of bone took place. In another experiment he took the periosteum from the radius and wrapped it round a neighbouring muscle, hoping, that if periosteum did produce bone, to find new bone formation, but the result showed there was no bone formed round the muscle, whereas from the bone from which the periosteum had been removed a node had formed. In speaking of the formation of callus, Sir William remarked that the large amount formed in animals was due to the movements of the limb after fracture, and the same thing occurred in man when the limb after fracture had been subjected to excessive movement. He next gave an account of some interesting experiments which he had made with reference to the growth of bone round rings inserted between the periosteum and the bone. Most textbooks stated that the bone which subsequently grew over the ring came from the periosteum, but the same result was obtained after the periosteum was removed. Experiments with regard to the transplantation of bone showed that if an inch of the circumference from one radius was taken and placed in the gap of another a proliferation occurred at either end, but especially where union took place. If, however, the transplanted bone was introduced in small pieces, then a greater reproduction of bone took place. The introduction of shavings of bone led to a great mass of bone formation, and cartilage was to be seen as a preliminary formation. If a flat piece of bone were introduced into the omentum it was either absorbed or bone was produced round it. Further, a piece of bone in a sponge imbedded in connective tissue led to the formation of cartilage cells. By means of glass tube experiments in which a small piece of bone was introduced into a glass tube full of blood, he showed that round the peripheral parts formation of bone took place. Sir William, who throughout the whole of his remarks confined himself to the anatomical side of his subject, next referred to the effect produced by introducing osteoblasts into the circulation and a spicule of bone into a false aneurysm. In the former case an embolus was formed, but in the latter a deposition of bone took place at the side of the aneurysm. Finally, an interesting case was detailed in which, after severe trauma, bone was developed in the thickness of muscle, a development so complete that, owing to the necessities of movement, a joint was actually formed between two portions of this abnormally formed bone. Cartilage as well as bone was present in this new formation.

DISCUSSION.

Professor A. C. GEDDES (Royal College of Surgeons, Dublin) said: Sir William Macewen has already placed us all under a debt to him for the light he has let into some of the darkest places of our knowledge in connexion with the development and growth of bone, normal and abnormal. I believe that I have read all his papers and his book upon this subject, and I know that I have learnt much from them, but I do not think that it is possible for any worker who approaches the problems from the point of view of the embryologist and morphologist to agree with all his conclusions. On one point, and it is a fundamental one, I find myself in complete disagreement with Sir William Macewen's conclusions. The two opening sentences of his book, *The Growth of Bone*, are: "In the study of the evolution of the osteoblast one sees in the fetal shaft that diaphysial ossification proceeds through cartilage. The nuclei of the cartilage cells divide and are set free as osteoblasts, and synchronously the cartilage envelope disappears." I have been unable to convince myself that this belief as to the origin of the osteoblasts is correct. The best evidence—and it is insufficient—that has yet been brought forward in its favour is Retterer's, published in 1908 in the *Journal de l'Anatomie et de la Physiologie*. Before him Ranvier and Müller held the same views. If this idea of the origin of the osteoblast ultimately be proved correct it will be necessary for us to revise almost our whole conception of the course of organic evolution, of cell histories and of cell lineages. First, it postulates that bone is a tissue of mesoblastic origin—in other words, that the endoskeleton of the higher animals is phylogenetically independent of the exoskeleton of the lower—a postulate which appears to me to be contrary to accepted "facts," which those who make it have done nothing to disprove. Second, it assumes that fully differentiated highly specialized cells can undergo a metamorphosis, can put back the clock of time and become as embryonic cells, an assumption contrary to everything we think we know about cells; third, it requires that the nature of a cell is determined by its general protoplasm and not by its nucleus. That to some extent this is true every one except extreme Weismannists will, I think, admit, but the form in which it is tacitly assumed by Sir William Macewen and Retterer is extreme and will not be readily accepted in default of much fuller evidence. In short, it may be quite true that osteoblasts are the nuclei of cartilage cells, but if it be the greater part of our knowledge of histogenesis, cytogenesis and morphology requires to be recast.

In my opinion the osteoblast is ectodermal in origin. For reasons advanced in full at a recent meeting of the Anatomical Society I believe that as a singleton or as one of a scattered group of three or four cells it migrates during early embryonic life from the deeper layers of the epiderm to the developing periosteum, through which it passes to reach the potential subperiosteal space, where it is joined by enormous numbers of its fellows and rapidly proliferates. Depending on the bone involved, its subsequent history varies, the ossification of the ribs being different from that of the metatarsal bones, for example, this in turn being different from the ossification of such a bone as the humerus or femur. These differences are associated with the two factors which may be expressed sufficiently intelligibly as the growth vigour of the cartilage cells and the pressure of the surrounding parts. In the case of a rib, for example, it is the existence of a positive pressure, resulting from the growth of the thoracic viscera, acting upon its concave aspect, and of a negative pressure, resulting from the growth of the superficial soft parts tending to adapt them to a larger curve and to draw them away from the rib, acting upon its convex aspect, which determines the site of formation of the subperiosteal space. This in turn compels the ossification of the ribs to be subperiosteal in type, for in the ossification of the ribs at least there can be no question of any cartilage cell giving rise to the osteoblasts. Between the metatarsals and the metacarpals on the one hand, and the principal long bones of the limbs on the other, there is a real difference in the growth vigour—the anabolic power—of the cartilage cells. With certain easily understood variations this power increases in amount steadily from the body axis towards the tips of the body processes and is the underlying cause of the differences between the body form of the short and of the tall man; of the tall man and of the eunuch and the eunuchoid; of the eunuch and the eunuchoid and of the giant. It is one of the most striking facts about the body, and it is almost ignored.[1]

The manner in which the cartilage cell gives place to the bone cell is the next important consideration. As a preliminary to endochondral ossification the cartilage cell undergoes a rapid hypertrophy which must, and in fact does, lead it into physiological difficulties, for like any sphere its mass increases as the cube, its surface as the square of its diameter. The proportionately diminishing surface is soon too small properly to support the contained mass. The nucleus becomes eccentric. Calcium droplets begin to form in the middle of the protoplasm, drift through it, and deposit in the matrix. Vacuoles appear. The cell becomes shrunken and the nucleus breaks up. And now we come to the point where the difference of opinion comes in. Every one, I think, admits that cells do break into cartilage from the subperiosteal space whenever the cartilage begins to be decrepit. If the cartilage cells are not very anabolic this irruption is delayed, and the osteoblasts in the subperiosteal space have time to deposit a rind of bone around the cartilage, but if the cartilage cells are very anabolic, as in the meta-

[1] *Proceedings of Royal Society of Edinburgh*, vol. xxxi, Part I, No. 6.

tarsals and metacarpals, there is no time for the formation of a bone rind before the cartilage cells are so hypertrophied and devitalized that they can no longer resist the advance of the invading cells. To some these invaders are osteoblasts, to others, apparently, they are not. Personally, I am convinced that they are the osteoblasts, and for this belief there are two definite reasons. First, if cartilage, in which ossification is just commencing, is sectioned and stained with Sabin's modification of Mallory's stain, the osteoblasts which lay down the peripheral rind of bone, the cells which irrupt, and the osteoblasts forming the endochondral bone, all stain to the same bright red tint, which differs markedly from the blue-red tint of the cartilage cells. This makes it extremely improbable that the endochondral osteoblasts are different things from the subperiosteal, and it also makes it extremely improbable that they have any direct genetic relation with the cartilage cells, for it is a rule, to which I know no exception, that cells of a common lineage have for a time similar stain reactions. And, secondly, if the tissue examined is serially sectioned and no sections are missed, it is always possible to trace a continuous chain of osteoblasts and definite cell paths from one or other of the numerous points of irruption to the most advanced osteoblast in the cartilage—at least I have found it so in many hundred specimens. Further reasons in support of this belief are provided by the phylogenetic facts and general considerations already referred to.

The rôle of cartilage in ossification is, I think, quite plain. Recent experiments on the cultivation of the tissues in extraneous media have made it clear that cells require support, a scaffolding upon which they can move, and there can be no doubt that the calcified cartilage provides a scaffolding for the early stages of bone formation. The relation of calcified matrix to bone is, I think, best brought out in Congo-red stained specimens. Recently the opinion has been advanced that the osteoclast is an artefact, and is in reality a piece of bone which has given up or redissolved its lime salts. Doubtful appearances resulting from some such cause may occur in some cases, but osteoclasts are present long before there is any piece of bone as large as themselves. The evidence available goes to show that they are hybrid syncytial masses composed of the fused bodies of two or more cartilage cells in which several osteoblasts have been engulfed. This is an example of a sort of table turning. Normally osteoblasts ingest the débris of the cartilage cells; exceptionally when the cartilage cell is not sufficiently devitalized it ingests the osteoblast that tries to ingest it.

In conclusion, I desire to express my appreciation of Sir William Macewen's work and of the beauty of his experimental proof that the periosteum takes no part in the work of bone formation, and that after it is once fully formed it acts as a limiter of bone formation. Before sitting down may I be permitted to say that in studying the histology of bone growth and bone development I have found it necessary to make use of a very large number of stain combinations in order to circumvent the misleading pictures given by the stains containing haematoxylin? I think Congo red, Sabin's modification of Mallory's stain, and the Bismarck brown stains the most generally useful, and haematoxylin the most confusing stain it is possible to employ in this particular field of work.

Professor PATERSON (University of Liverpool) said the subject was of fundamental importance to anatomists as well as surgeons. There were still many problems associated with it which await solution. The causes and varieties of ossification, the reasons for membranous or cartilaginous bone formation, the reasons for the differences in time of production of different bones, were still unanswered questions. The cause of ossification appeared to be essentially irritation; the agent was an embryonic connective tissue cell, the process was a chemical one which occurred *in situ*, and it was extravascular. Sir William Macewen's work had led them a very considerable way, and had been of the utmost importance not only in relation to practical anatomy and surgery, but also in relation to the larger questions associated with morphology and comparative anatomy. After adducing instances in support of Sir William Macewen's researches, the speaker pointed out that it was significant that the Section of Anatomy had chosen this subject with which to begin the work of the meeting. The necessity was emphasized of combining in a properly equipped anatomical school the subjects of embryology and histology. To the anatomist a subject like this was of prime importance, but it was only one of many. It was obviously impossible to divorce microscopic and macroscopic anatomy, either in teaching or research.

Mr. DOUGLAS-CRAWFORD (Liverpool) said he had, after frequent observations in hospital, accepted Sir William Macewen's views on formation and growth of bone. Autogenous transplantation of small pieces of bone had been most effective in repairing breaches of continuity of bone. Cartilage often appeared as a stage in the repair of bone in such cases where the fracture ends of bone had not been kept at rest. He thought that Professor Geddes's view of the origin of the osteoblast might explain the formation of new bone in cases of acute necrosis, in which the whole diaphysis had been removed.

The PRESIDENT (Mr. William Wright) pointed out that there must be other ways of forming bone than from cartilage, as evidenced in the formation of the membrane bones of the cranium, and doubted whether it was possible to remove the periosteum from a healthy bone without so fundamentally affecting the periosteum that its future behaviour could scarcely be regarded as the normal behaviour of intact periosteum. He further thought that the evidence of comparative anatomy was in support of Professor Geddes's contention that bone was ectodermal in origin.

Sir WILLIAM MACEWEN, in his reply, said that, as Professor Geddes's observations depended so largely on colour staining, he wondered if his deductions were absolutely reliable. He would, however, like to see more of his work, though he still adhered to the fact that bone produced cartilage and cartilage bone.

THE DIAPHRAGM IN A 7 MM. HUMAN EMBRYO.

By PETER THOMPSON, M.D.,
Professor of Anatomy, The University, Birmingham.

(*Abstract.*)

DESCRIPTIONS of the septum transversum, or primary diaphragm, in embryos of about twenty-eight days and about 7 mm. in length have been given by various writers—notably, His, Bromann, Mall, Uskow, and Piper—and the arrangement of the various parts of which it is composed is therefore well known. But most teachers of anatomy would admit that there are few subjects more difficult to describe or more misunderstood than the development of the diaphragm. The main reason is the want of adequate illustration, and not until we have a complete series of models of the cervical and thoracic regions of embryos of various sizes, with the heart and liver removable, leaving the diaphragm *in situ*, will it be possible to give a clear picture of the process.

The following is a brief account of a demonstration given of the diaphragm in a four-weeks human embryo in which such a dissection had been carried out. In this preparation a perfectly satisfactory view of the upper and lower surfaces of the diaphragm, enlarged fifty times, was obtained, as well as the connexions between the dorsal surfaces of the heart and liver on the one hand, and the posterior body wall on the other. At this stage, in which the diaphragm forms an inclined plane, placed in the upper thoracic region, and making an angle, directed backwards, of about 45 degrees with the primitive skeletal axis, four points stand out clearly. These are: (1) The thin partition, known as the septum transversum, forming nearly the whole of the inclined plane referred to above; (2) at its dorsal edge, on each side, the pulmonary ridge (Mall)—a highly arched fold of tissue, in immediate relation to the lung bud, attached ventrally to the septum and dorsally to the mesial side of the Wolffian body; (3) two apertures, one on each side, through which the lung buds pass into the embryonic peritoneal cavity and impress the dorsal surface of the liver; and (4) a single aperture placed on

the right side, immediately ventral to the right lung bud, for the passage of the ductus venosus (Botalli) from the liver to the right auricle.

Of these four points, the pulmonary ridge is particularly interesting, since, as F. P. Mall has pointed out, the relation of the ridge to the phrenic nerve, as well as its form in older embryos, makes of it the anlage of both the pleuro-pericardial and pleuro-peritoneal membranes.

In the model from which this demonstration was given it was clearly seen that the pulmonary ridge had definite cephalic and caudal edges, and that the cephalic edge was the pleuro-pericardial membrane, and the caudal edge the pleuro-peritoneal membrane. The former, which connects the right auricle of the heart with the posterior wall of the pericardium, extends forwards as far as the duct of Cuvier, and backwards as far as the septum transversum, and constitutes the lateral boundary of a narrow cleft, the pleuro-pericardial aperture. The pleuro-peritoneal membrane guards the lateral opening of communication between the pleural and peritoneal cavities. From this it will be seen that the pleural cavity is extremely small at this stage, and that it is the part of the coelom opposite the pulmonary ridge. At its cephalic edge it is continuous with the pericardial cavity, and at its caudal edge with the peritoneal cavity. As the lung enlarges and invades the thorax it carries with it the surrounding pleural space, which has in the meanwhile become completely closed off from the pericardial and peritoneal cavities.

In the embryo of three weeks (2.5 mm.) the septum transversum is a relatively thick crescentic mass with no definite pulmonary ridge. Into this mass the liver bud grows, and as it assumes the characteristic form of the fourth week, with definite right and left lobes, gall bladder, and a large "bare area" in front, the liver separates to a considerable extent from the septum. The "bare area" just mentioned is really an area of contact between the two, free from peritoneal investment, and when the separation is artificially made, and the liver removed, the septum is seen as the thin partition to which reference has already been made.

To complete the demonstration of the diaphragm at the end of the fourth week, it should be pointed out that, just as in the third week, the septum is continuous with the dorsal mesocardium. Also that the mesenteric septum leaves the liver to become attached to its under surface with its two layers relatively widely separated, and not as in the adult, with the two layers in contact to form the falciform ligament. Of course the separation between the two layers in the former case is the result of the incomplete separation of liver and septum already referred to. This mesenteric septum, after enclosing the liver, is reflected from its dorsal surface in two parts: One is the gastro-hepatic omentum; the other unites the liver and the right lung bud (*Nebengekröse*, Bromann), and is continued caudalwards between liver and posterior body wall as a double fold, in which the inferior vena cava grows, and called, therefore, the "plica venae cavae." Between these two parts or subdivisions of the mesenteric septum lies the pocket of the general peritoneal cavity known as the bursa omentalis.

ABNORMALITY OF THE URINARY SYSTEM.

(Demonstration.)

By A. CAMPBELL GEDDES, M.D.,

Professor of Anatomy, Royal College of Surgeons, Dublin.

THE abnormality was found in the body of a senile female. There is only one kidney. This is of the ordinary size, and lies in the normal position for the right kidney. It possesses two ureters. The upper of these emerges from the anterior aspect of the kidney at the junction of its upper and middle thirds, runs down across the front of the kidney, reaches the psoas muscle and thereafter has a course and point of entrance into the bladder exactly like that of the normal right ureter. The lower ureter emerges from a normal hilum anterior to the lower renal vessels, courses obliquely across the front of the vertebral column and the right and left common iliac arteries, which have a high origin, to reach the inner border of the left psoas muscle at the level of the crest of the ilium. From this point it follows the course normal for the left ureter, and opens into the bladder at the normal point for that ureter. In the bladder the internal trigone and torus interuretericus are quite normal.

Further abnormalities in the specimen are the extremely tortuous course of the aorta and the fact that the lower part of the inferior vena cava lies to its left. Just below the point of origin of the superior mesenteric artery the vein crosses obliquely in front of the aorta. A small vein (persistent right post-cardinal) occupies the position of the normal cava.

The positions occupied by the ureters at their points of emergence from the kidney suggests that the developmental origin of the abnormality was somewhat similar to the development of a horseshoe kidney which for some reason, unexplained, got pushed over to the right side, where the pressure to which it was subjected had the effect of moulding it to the general shape of a right kidney.

A SPECIMEN ILLUSTRATING PSEUDO-HERMAPHRODITISM.

(Demonstration.)

By A. CAMPBELL GEDDES, M.D.,

Professor of Anatomy, Royal College of Surgeons, Dublin.

THE specimen was obtained from the body of a lady who died at the age of 91 years. In life she had believed herself to be a male, and was distinctly male in stature and in facies. The external organs of generation supported, to some extent, her belief. Hanging down between the thighs was a penis-like structure nearly 3 in. long. The "glans" was distinctly red, and there appeared to be a small orifice at its tip. From this a small amount of white discharge could be expressed. There did not appear to be any vaginal orifice.

On dissection, perfectly normal female internal organs were discovered. The lower opening of the vagina, explored from above, was found just to admit of the passage of a porcupine quill. The "penis" was in reality an overgrown left labium minus; the "glans" its venously congested tip; the apical orifice a little sinus from which discharge came.

The lady had many years ago come to believe that she was a male, and the rightful heir to a title. So firm was this belief and so impossible were her actions, that her relatives had her confined in an asylum, in which she had remained for many years, long outliving her own generation and all who had known her; but apparently at the time of her certification there was no doubt as to her sex, and it is believed that the condition, which certainly simulated the male in some respects, developed after the fixed idea as to her sex had asserted itself.

DISCUSSION.

Dr. W. P. GOWLAND (Liverpool) referred to a case of pseudo-hermaphroditism in a man who was said to have had a right-sided inguinal hernia from birth, and had, in consequence, worn a truss continuously. At the age of 35 years he came under notice with symptoms resembling those of strangulated hernia. On examination there were no testicles to be found in the scrotum, and the left half of the latter was so small and the external ring so ill-developed that in all probability no testicle had ever been present in it. A tender lump being felt in the right groin a diagnosis of "torsion of the testis" was made, and an operation performed forthwith. Whilst anaesthesia was being induced the above-mentioned tender lump descended into the scrotum, and was followed by a second lump representing the other testicle. Immediately afterwards

a third much firmer and harder lump appeared between the other two. The whole mass was found to be enclosed in a sac containing fluid and to consist of two testicles in a broad ligament with a well-developed muscular uterus from which a narrow, thick-walled vagina ran to the region of the neck of the bladder. No communication with bladder or rectum could be made out, but a probe could easily be felt through the rectal wall. No prostate could be felt. Two tubes ran on either side from the uterus to the neighbourhood of the testicle. The appearance of each testicle was very like that of an enlarged cystic ovary, but on section the testicular substance seemed fairly typical and the cysts disappeared, being mainly subcortical. Microscopically there was absence of the thick hyaline sheaths so commonly found round the seminal tubes in cases of retained testis. Sir John Bland-Sutton expressed the opinion that the organs were probably functional but that it was difficult to see how the secretion could pass externally. A photograph was shown, from which it could be seen that the penis was well formed, with no sign of any external genitalia conforming to the female type. The breasts were not unduly developed and whilst in hospital the man grew a beard. As a boy the patient was backward at school and did not participate in the rough games of the other boys. He has always been quiet and retiring, with no disposition to associate with the opposite sex. He states that he has never had sexual connexion and that he has never had an erection, though on these subjects he is naturally reserved.

A CASE OF TRANSPOSITION OF VISCERA.

(Demonstration.)

By J. S. MANSON, M.B.,
Warrington.

THE subject of this developmental abnormality was a youth 17 years of age. He was a fifth child of a family of eight, three of whom died in infancy. The father, mother, and three other members of the family showed no peculiarities whatever. On the father's side there was a history of twin pregnancies. Two of his sisters have had twins, and so has a brother's daughter. There was no history of twins on the mother's side. The history of twin pregnancies may have some bearing on the origin of the condition, for, according to one theory, the abnormality is due to the development of a right-handed uniovular twin, with the complete disappearance of the left one. The famous conjoined twins, Maria-Rosalina, showed that Maria had the various organs normally placed, while Rosalina exhibited transposition.

On examining the case, together with the series of x-ray photographs, for which the exhibitor was indebted to Dr. Thurstan Holland, it was seen that the stomach was on the right, the liver dullness on the left, and the heart and spleen on the right side.

Discussion.

In the general discussion which followed the demonstration of this case it was agreed that no satisfactory explanation of this well-known condition could be given.

A CONTRIBUTION TO THE ANATOMY OF THE VESTIGIAL STRUCTURES IN THE NEIGHBOURHOOD OF THE EPIDIDYMIS AND CORD.

BY
WILLIAM WRIGHT, D.Sc., F.R.C.S.,
Professor of Anatomy, London Hospital,
AND
Mr. R. G. BROWN.

(Abstract.)

THIS research was undertaken with the object of testing the correctness of the present-day view of the hydatids of Morgagni. (1) It is usually stated that there are two hydatids of Morgagni in the male. (2) In one case it is sessile, in the other it is stalked. (3) The sessile is a remnant of the Müllerian duct, the stalked a remnant of the Wolffian duct. Fifty-three testicles were examined to ascertain the number of hydatids, site of attachment, shape, size, and particularly the structure as disclosed by microscopic examination. The authors made serial sections of five adult and two fetal testicles. Of the adult hydatids, the structure was identical in both the sessile and the stalked varieties. In one adult, however, tubular structure was found. Of the fetal specimens examined by serial sections, one was at full term and the other at seven months, and in both tubular structure occurred. An examination by serial section was also made of the spermatic cord, 1.3 mm. above the caput epididymis down to the testis, and a distinct tubule was observed which divided into two, each of which terminated 0.85 mm. from the caput. Nearer the testis (0.74 mm. above the caput) another tubule was found, the two tubules representing the organ of Giraldès.

A COMPARISON BETWEEN TWO HEARTS.

By J. STUART DICKEY, M.D., B.Ch.,
Senior Demonstrator of Anatomy, Queen's University, Belfast.

DURING the past winter session I made a study of a series of cross sections through the cardiac region in two subjects.

One of these was a robustly built man, aged 50, who was said to have died of cerebral haemorrhage. The other was a slightly built young woman of 20 years, who died of pulmonary phthisis (haemorrhage).

The condition of the heart and mediastinum in these two subjects presented several well-marked contrasts, more especially in the degree of distension of the heart cavities and in the form of the posterior mediastinum. It was suggested to me by Professor Symington that I should ascertain, by means of reconstructed drawings, the form of the heart and its relations to the anterior thoracic wall in each case.

Before freezing each trunk it was divided by Professor Symington with a large knife and fine saw at the level of the nipples into an upper and lower portion. These portions were frozen and cut into transverse slabs 1 in. thick by Mr. P. T. Crymble and myself.

In the case of the female subject six of the planes of section passed through the heart and the aortic arch, forming the six slabs indicated in Fig. 5. The upper surfaces of two of these slabs have been reproduced (Figs. 1 and 2), and are respectively 4 and 6 in. below the top of the sternum.

In the case of the male subject seven of the planes of section passed through the heart and aortic arch, forming the seven slabs represented in Fig. 6. Figs. 3 and 4 have been drawn from the upper surface of two slabs which were also 4 and 6 in. respectively below the top of the sternum. Figs. 5 and 6 are drawings constructed from a study of the complete series of sections in each case.

I shall briefly refer to the series of six sections which passed through the heart and aortic arch of the female subject (see Fig. 5).

1. The first section was made through the lower part of the aortic arch, 1 in. below the top of the sternum, and passed through the lower border of the first costal cartilage in front, and through the upper part of the fifth dorsal vertebra behind. The highest part of the aortic arch was only $\frac{1}{4}$ in. below the upper border of the sternum, but, owing to the obliquity of the ribs, it was not at all high in relation to the vertebral column.

2. The plane of section 2 (Fig. 5) was 2 in. below the top of the sternum, and passed anteriorly through the junction of the second costal cartilage with the sternum, and through the bodies of the seventh and eighth thoracic vertebrae behind. The left auricle, both auricular appendices, and the pulmonary valve were exposed by this cut, so that the base or upper border of the heart was rather high in relation to the anterior chest wall, these structures being usually found at the level of the upper border of the third costal cartilage; but, on the other hand, they were low in relation to the vertebral column, the base of the heart being in this case opposite the seventh and eighth vertebrae instead of the fifth thoracic vertebra (which is the level usually given).

3. The third section was 3 in. below the top of the sternum, and passed through the third costal cartilage at the sternum and through the eighth thoracic vertebra behind; it cut through the right and left auricles, and through the upper part of the mitral and tricuspid valves, and was just below the aortic valve, as may be seen in Fig. 5.

4. Fig. 1 represents the upper surface of slab 4, the plane of section being 4 in. below the top of the sternum. The fourth right costal cartilage is divided at the sternum and the ninth thoracic vertebra behind. This figure illustrates the small size of the heart and aorta and the voluminous lungs. The posterior mediastinum is laterally compressed between the lungs, so that it forms a thin, easily-displaced "dorsal mesentery" (Keith[1]) behind the heart. A small heart is described as occurring in three conditions, all of which were present in this subject—namely, in hypo-

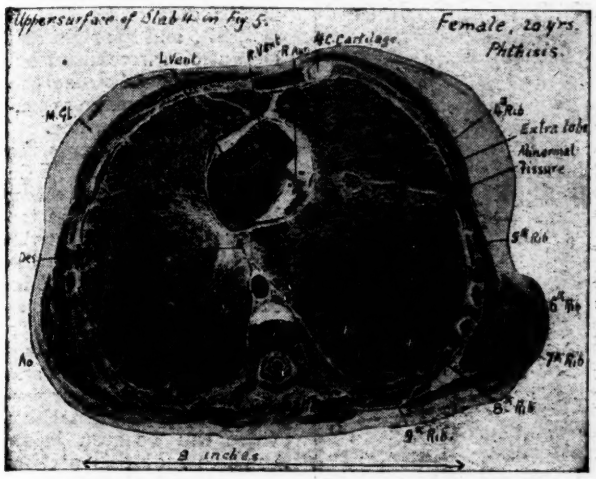

Fig. 1.—The inferior vena cava is seen behind the empty auricle. Oes. = oesophagus, and Ao. = aorta, situated in the "dorsal or posterior mesentery of the thorax" (Keith).

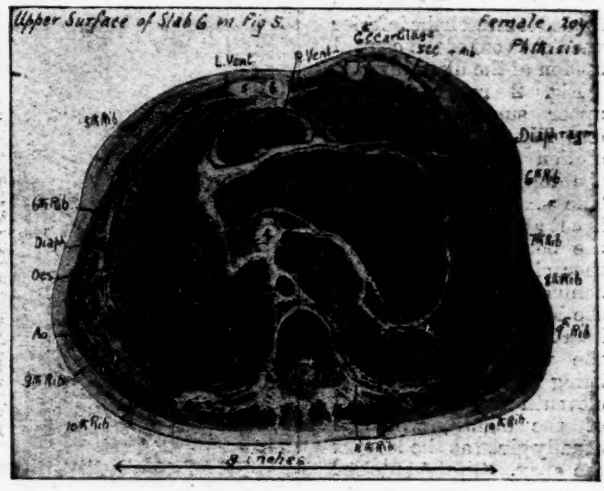

Fig. 2.—Plane of this section was 6 in. below the top of the sternum. Oes. = oesophagus, Ao. = aorta.

plasia of the vascular system, in pulmonary phthisis (frequently), and in some cases of emphysema in young subjects. There had also been a copious haemorrhage in this subject, the stomach, trachea, and lung cavities being full of blood clot. The heart accordingly is nearly empty, and presents a striking contrast to that of the man of 50 years, in whom the auricles are distended with blood (Fig. 3). The remarkable condition of the posterior mediastinum seen in Figs. 1 and 2 appears to be partly due to the small size of the heart, especially in its depleted condition from haemorrhage. The auricular part of the heart could not dilate with blood as

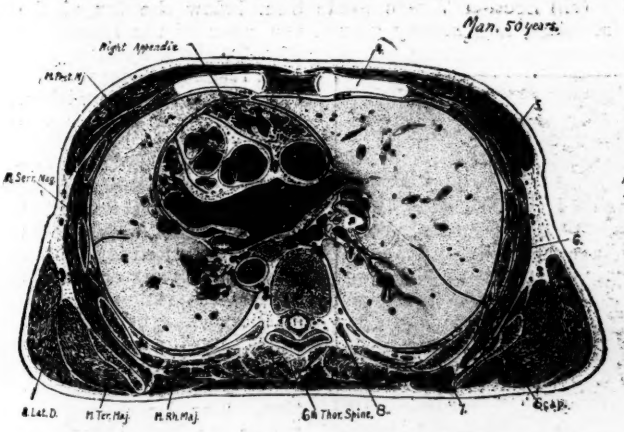

Fig. 3.—P = Pulmonary valve; A. = aortic valve; S.V.C. = superior vena cava; L.A. = left auricle.

normally occurs when the ventricles contract, so that the heart, becoming empty, was reduced to a very small volume, and the lungs came close together behind the heart to occupy the position usually required for the auricles. The fact that the lungs were emphysematous, and that the antero-posterior diameter of the thorax was large in relation to the transverse diameter (80 : 100) also appears to have assisted in producing the laterally compressed condition of the posterior mediastinum. In the case of the man of 50 years, the heart was both relatively and absolutely large; the auricles were dilated with blood; the antero-posterior chest diameter was small in proportion to the transverse diameter (66 : 100), and the lungs were not emphysematous; consequently in his case the posterior mediastinum appears to have been compressed from before backwards. The "middle lung field," or clear retrocardiac area, which is seen on lateral illumination of the thorax with the x rays, would probably have been increased in the female and diminished in the male subject, had such a method of examination been adopted during life. The cavity of the right auricle only extended $\frac{1}{4}$ in. below the plane of this section (Fig. 1), and it can be seen that the inferior vena cava has not opened into the right auricle, the upper edge of the Eustachian valve, which guards its opening, being a little above the plane of this section (see Fig. 5).

5. The next section was at the level of the nipples, and was made 5 in. below the top of the sternum. It passed through the junction of the fifth costal cartilage with the sternum, and through the upper part of the tenth thoracic vertebra behind. The two ventricles of the heart were found at this level, and the intrathoracic portion of the inferior vena cava. The anterior surface of this vein, which was of abnormal length, was covered by the serous pericardium for a distance of 2.8 cm. or about $1\frac{1}{8}$ in. In the male

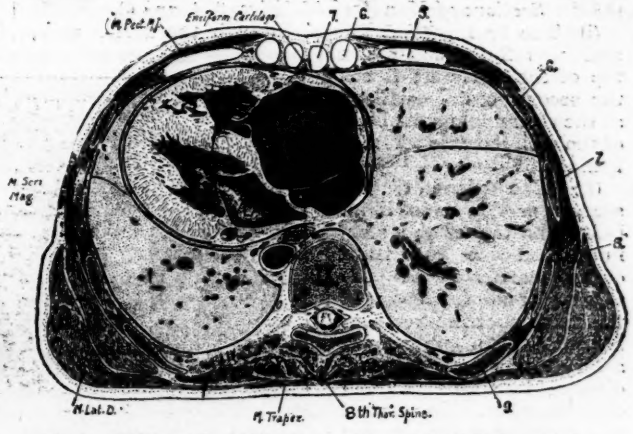

Fig. 4.—R.A. = Right auricle; L.A. = left auricle; I.V.C. = inferior vena cava; Ao. = aorta.

subject (see Fig. 6) all four cavities of the heart were cut at the level of the nipples, and the inferior vena cava was covered by serous pericardium for only 0.5 cm. ($\frac{1}{5}$ in.), and entered the right auricle almost directly above the diaphragm. The abnormal fissure seen in Fig. 1 extended down to the base of the lung and indicates the presence of an extra lobe on the lung base. In this connexion I was interested to learn that "where an azygos lobe separates the central tendon from the pericardium, as is the case in most mammals, the respiratory movement of the heart and pulmonary roots is less in extent. In such animals the inferior vena cava is extremely elastic (it can be stretched to two or three

times its length in relaxation) to permit the central tendon moving independently of the heart" (Keith).[3] It occurred to me that there might be some causal connexion between the presence of the extra lobe shown in Fig. 1 and the great length of the inferior vena cava above the diaphragm in this subject. But the low position of the diaphragm (which is due to the co-existing pulmonary emphysema) and the upward retraction of the empty right auricle may also have tended to stretch the inferior vena cava out of the central tendon of the diaphragm.

Fig. 2 represents the upper surface of Slab 6 (see Fig. 5), the plane of section being 6 in. below the top of the sternum. The sixth costal cartilage is cut at the sternum, while the body of the eleventh thoracic vertebra is divided behind. It is evident that the level of the apex of the heart is low with regard to the vertebral column, it being at the level of the eleventh vertebra instead of the eighth, which is usually given as the level of the apex. On the anterior chest wall the apex appears to be slightly higher than normal, being situated behind the fifth left costal cartilage (Fig. 5). The flattened condition of the right and left ventricles (Fig. 2) appears to be due to their having been compressed between the anterior chest wall and lung margins on the one hand and the sloping upper aspect of the liver on the other; the lower part of the pericardial sac was accordingly empty and collapsed. (See outline of pericardium in Fig. 5 below the heart.)

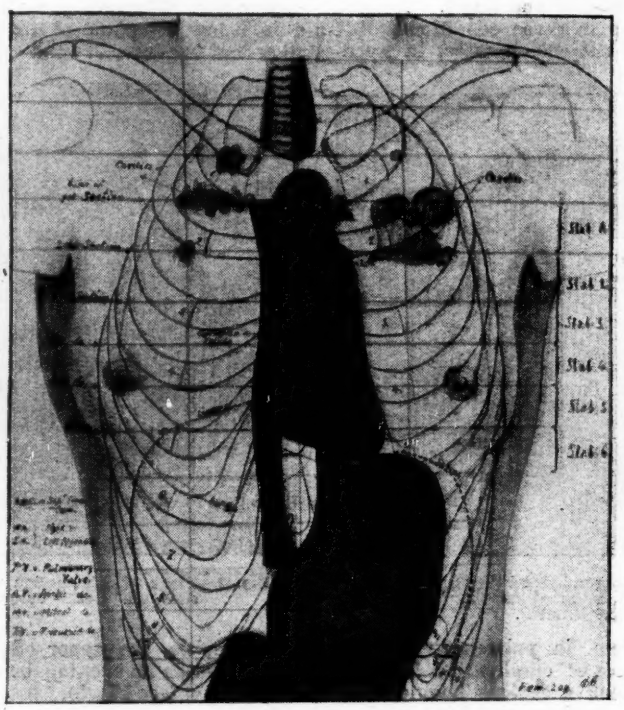

Fig. 5.—Reconstructed drawing from the sections through the heart, etc., of the female subject, aged 20. Viewed from in front. The ribs and sternum are shown.

Sections of Man aged 50 (Figs. 3, 4, and 6).

(i) The first section passed through the aortic arch, and was 2 in. below the top of the sternum; it cut the second costal cartilage at the sternum and the body of the fifth thoracic vertebra behind.

(ii) The plane of the second section was 3 in. below the top of the sternum, and cut the third costal cartilage at the sternum and the body of the sixth thoracic vertebra behind. The pulmonary artery was cut at its division into its right and left branches. No part of the heart was cut at this level, though the upper border of the heart usually corresponds in front with that of the third costal cartilage, and frequently with the level of the fifth thoracic vertebra behind.

(iii) Fig. 3 is drawn from the upper surface of Slab 3 (see section 3, Fig. 6), the plane of section being 4 in. below the top of the sternum. The fourth costal cartilage is divided at the sternum, and the seventh thoracic vertebra behind. The pulmonary valve, the left auricle, and both auricular appendices are cut at this level. The aortic valve is just visible below, and the superior vena cava has not yet fully opened into the right auricle. The level of these structures when projected on the front of the chest is much lower than in the female subject (cf. Figs. 5 and 6).

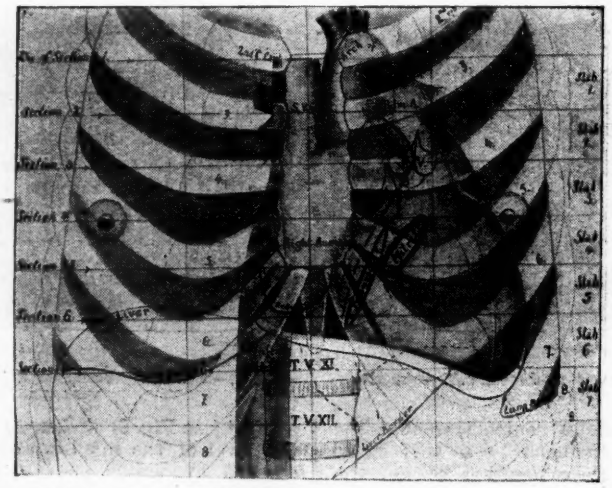

Fig. 6.—Reconstructed drawing of the heart in a man of 50, viewed in relation to the anterior chest wall. A lateral vertical line has been drawn 6 c.m. (2⅜ in.) on each side of the median line of the body in both Fig. 5 and Fig. 6.

(iv) The next section (No. 4 in Fig. 6) was through the nipple level, or 5 in. below the top of the sternum, and cut the fifth cartilage at the sternum and the eighth thoracic vertebra behind. All four cavities of the heart were divided (not so in the case of the female subject), and the right and left auricles were distended with blood. *Ante-mortem* clot was found in the appendix of the right auricle.

(v) Fig. 4 represents the upper surface of slab 5 (in Fig. 6), the plane of section being 6 in. below the top of the sternum, or at the level of the base of the ensiform cartilage. The mitral and tricuspid valves are cut through, the cusps of the mitral valve being somewhat sclerosed and thickened. The upper portion of the Eustachian valve can be seen below the plane of this section, separating the inferior vena cava from the right auricle.

(vi) Section 6 was made 7 in. below the top of the sternum and cut through the ensiform cartilage in front and the tenth thoracic vertebra behind. The under surface of the dilated right auricle was in contact with the central tendon of the diaphragm for an area of 3¾ sq. in., and had displaced the right ventricle and the apex of the heart downwards and to the left. [In the female subject the right auricle was empty, and did not come into contact with the central tendon at all (cf. Figs. 5 and 6).]

(vii) Section 7 was made 8 in. below the top of the sternum, and merely grazed the apex of the heart (see Fig. 6). The apex in this man reached the level of the eleventh thoracic vertebra, as was also the case in the female subject; but on the anterior chest wall the apex of the man reached a lower level (sixth intercostal space). This difference is partly accounted for by the greater obliquity of the ribs in the female subject.

The drawing of the female heart from the front (Fig. 5) shows that the heart is elongated in a vertical direction. The heart and its valves are higher than normal in relation to the costal cartilages, and the heart does not extend as far outwards on each side of the median plane as it should; thus, on the left side it falls half an inch internal to a lateral vertical line drawn 6 cm., or 2⅜ in., from the median line; the right auricle only reaches a short distance (¼ in.) to the right of the sternum. The margo acutus or lower border of the right ventricle, which is usually nearly horizontal, is bent at a right angle and presents a vertical as well as a horizontal portion; the vertical portion formed the right border of the heart from

the level of the fourth to the sixth right interspaces (see Fig. 5). Apparently, this change of position of the right ventricle has been necessitated by the elevated and contracted (empty) condition of the right auricle as the result of pulmonary haemorrhage, the right auricle being 1½ in. *above* the junction of the ensiform cartilage with the body of the sternum. The inward displacement of the apex of the heart is partly due to the same cause.

In Fig. 6 the heart of the man is seen to be larger than normal both in its lateral and vertical dimensions. The right auricle is seen to reach about 1½ in. *below* the junction of the ensiform cartilage with the body of the sternum. All the valves are fully 1 in. lower than their normal position, and about 2 in. below their level in the female subject. The apex of the heart reaches ½ in. beyond the left mamillary line, being displaced outwards by the dilated right auricle.

I would like, in conclusion, to acknowledge the kind help and valuable suggestions of Professor Symington.

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SOME NOTES ON THE STOMACH.

By RICHARD J. ANDERSON, M.D.,

Professor of Biology, Galway.

THE stomach in animals varies a good deal in form and structure. It is not improbable that the form in many species may vary in different individuals or in the same individual to some extent. The pose seems sometimes to affect the form and position of the stomach in man. The stomach of a Tursio presented some features of interest. The animal was 12 ft. long; the teeth were worn down as if the animal had been accustomed to masticate its food. The oesophagus was 6 in. in diameter, and led to a stomach paunch-like in form with a capacity of 20 litres. A large pyloric pouch, a second stomach, extended backwards, and had a small aperture in front. The bones of several fish were found in the first stomach, and some crustaceans which were part of the contents of the fish swallowed. The mucous membrane of the oesophagus was very like that of the paunch. The small stomach contained no undigested food. Some of the skeletons had not been in the small stomach. It is a question, then, whether the second stomach did not secrete juice and pour it out to aid in the digestion of the food in the first stomach. There was some vegetable débris in the stomach contents. The small stomach was 5 in. long by 4 in. broad as it lay flat.

A pyloric ventricle is sometimes found in man. Cricetus has an hour-glass stomach, so have some other rodents. The stomach of a rabbit when packed with grass is oval. It may be constricted when empty.

A tubular stomach is present in Testudo, Coluber, and Proteus. The stomach is transverse in the first in response to the body's breadth. Some of the contracted stomachs figured by His are modified tubular.

The common seal has a vertical stomach that turns upward near the pyloric end. This stomach is somewhat smoother above than below. Figures of shadow pictures given by Drs. Tuffier and Aubourg in *La Presse Médicale* resemble a little the outline of the seal's stomach; they, however, are much longer. One of them reaches down to the lower level of the fourth lumbar, and two much further, a good deal below the iliac crest, reaching into the true pelvis. Two of the stomachs figured by His seem to have had compartments and two show foldings. Delphis and Globeocephalus, and Bradypus, Manatus, and others have stomachs with compartments.

The beaver has a glandular stomach that precedes the larger stomach, which is succeeded by a pyloric bulla. A duodenal bulla is found in Tursio. The bursa entiana of some sharks may be referred to the same category. The tendency to subdivision or actual subdivision of the stomach in Halmaturus, and in another way in Dicotyles, becomes interesting when taken in connexion with the camera princeps, minor and tertia, of Professor His. A sacculated modified tubular form, which has been figured elsewhere, is a little like the stomach of a dolphin.

The receptacular nature of the stomach must have become emphasized after man had migrated to climates where his meals were likely to be interrupted; its toleration of the various substances and objects introduced excites surprise. The BRITISH MEDICAL JOURNAL published a letter some time ago which contained an account of a woman who ate large quantities of paper. Her health did not appear to suffer. From the stomach of a patient in a Paris hospital were obtained eight coffee spoons, the beak of a fork with three prongs, the handle of a fork, two long nails, one knife blade, a needle, and a tooth from a comb. She recovered from the effects of the operation. The articles were swallowed during six months. A Mulatto woman, who had been a long time in an asylum and seemed to enjoy good health, and had never shown signs of indigestion, died. A heap of nails, screws, and other things was found in her stomach. The number of nails alone amounted to more than 1,200.

In the old books on physiology the story was told of Canadian hunters who consumed 14 lb. of beef daily. Even without bread, this quantity seems large. Large herbivors, and many small ones, fill their stomachs, when the opportunity occurs, after a period of rest. The manyplies is sometimes packed with finely reduced food. Sea mammals consume sometimes a large quantity. Eschricht found thirteen porpoises and fourteen seals—very young ones, of course—in the stomach of an Orca. The stomach of a starling contained 160 insects—spiders, molluscs, etc.—and the débris of many more. The stomach of one marabou stork contained a joint of meat; another a large tortoise. A cat was found in a third. A secretary bird had in its stomach eleven large lizards, eleven small tortoises, a large number of insects nearly entire, and "three snakes as large as a man's arm." This bird kills many cobras; it is protected by the law. An ostrich, besides pebbles and sand, has been known to swallow "knives, old shoes, scraps of wood, feathers, and tenpenny nails." It is sometimes carnivorous. One is recorded to have swallowed a flock of ducklings.

Emus and rheas are also carnivorous. A cassowary has swallowed corks, nails, raw potatoes, ladies' blouses, bones, bones, etc. An ox has swallowed a washing of clothes. Rings and coins have been found in the stomachs of fish. The stomachs of some contain a huge heap of small animals. The stomach of one alligator (Ajax, in Cincinnati Gardens) contained a door knob, a pair of scissors, a small iron bootjack, nine rubber combs, 3 dollars and 18 cents. in silver and pennies, three pairs of spectacles without their glasses, a fish-hook 3 in. long, a *meteor* (2½ oz. in weight), seventeen toothbrushes, a portion of an iron garden rake containing three teeth. It seems not improbable that some of the above were thrown into the enclosure by mischievous people. Mr. Hagenbeck says that the largest living snake up to date is 26 ft. long. A Borneo python has been known to swallow a goat weighing 31 lb., and swallowed it as though "it had been a cherry," and later swallowed a buck 43 lb. in weight; a week later it swallowed a Siberian goat. This beats the man who ate as much food at one meal and slept enough afterwards to last for three days. A 9-ft. python swallowed a 7-ft. python that had already swallowed a rabbit. An Indian python swallowed four lambs within twenty-four hours, each lamb 12 to 19 lb. in weight. Eleven days afterwards the python took another lamb; the wool was thrown out in pellets. Elephants are known to swallow stones or pebbles. Portions of pine-tree shoots were found in the stomach of a mammoth kept fresh by the ice at the mouth of the Lena. In recognizing the full value of the stomach as a digestion organ, one may be allowed to appeal for its full recognition as a receiving and storing organ even in man of the present epoch, who by his hardening it (by acids) and softening it (with alkalis), alternately or by turns, treats the stomach like a candid friend that is easier to put up with than got rid of.

ASYMMETRY.

By RICHARD J. ANDERSON, M.D.,

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BILATERAL symmetry and radial symmetry, actinomorphy and zygomorphy, are the terms generally used to express the two common conditions of symmetry. There are some doubtful cases. The starfishes, in view of their development, are sometimes placed in the zygomorphic group. Bilateral symmetry interests one so much that one

becomes peevish when confronted with examples of change in one side of such a nature that symmetry is spoiled. The asymmetric conditions of some molluscs and fish are familiar. The asymmetry of the viscera in snakes is obviously due to the narrowing of the body cavity and its elongation. The great development of one ovary in birds is explained as due to the size of the eggs. The abdominal aorta rather than the chylopoietic is connected with this. The asymmetry of the skull in the dolphin tribe is noted—it is emphasized in the narwhal. In some skulls of Beluga it is much less marked than in the dolphin. It has been stated that the condition may be due to the disposition that animals have to present a larger surface to an opposing or oncoming foe, or a diminished surface to a powerful, relentless enemy. It is probable that the explanation has some connexion with the nature of the habitat, relation of the sea to land, and the nature of the illumination. Putting to one side the best known cases of asymmetry in man, also all the cases due to pathological causes, there still remains a large number of cases of asymmetry. The percentages of asymmetric cases given long ago by Viazzi and others, have been increased, and they are regarded as not so significant according to the further accumulation of facts. Viazzi held that anomalies were more common in man, especially savage man, than in woman, and more so amongst males than amongst the females of animals. Lombroso held that asymmetry was commoner amongst mammals than other classes. In some groups 50 per cent. was the average.

Anomalies seem to be, however, commoner in man than animals, and the power of imitation may influence muscle development racially and sexually. The skull presents asymmetry so often in the case of man that it has ceased to excite any surprise. The thickness of the cranial bones is commonly different on opposite sides, often conspicuously so, and some changes in the circumferential dimensions have been connected with special lateral development—for example, the enlargement of the upper part of the left occipital bone, and the corresponding diminution of the lower fossa. The posterior lobe of the left brain hemisphere Klatsch and Elliot Smith showed to be larger than the right. These changes are associated with right-handedness, and have been referred to the relation of the optic centres with the motor and the speech centres. Eternod has emphasized the importance of studying the actual condition of the skull. The monkeys of the Far East (gibbon and orang) have been stated to be generally right-handed, while the chimpanzee and gorilla are left-handed. A well-known writer has recently said that each cerebral hemisphere has in its "cross" action a "principal action" in man. Unilateral lesion is often only exhibited in this way. (1) The direct action is less immediately disclosed than the cross action. (2) Amongst the unilateral accomplishments language is a power supremely possessed by the left hemisphere. Lesions of the left seem to be more usually manifested by direct disturbances than are those of the right. (3) Bilateral (*a*) crossed fasciculi (fasciculi pyramidales) are the most important; (*b*) direct fasciculi (fasciculi homolaterales); (*c*) corpus callosum and crossed fasciculi. The corpus callosum does not seem to be of so much importance to the ape as it does to man; nor can it be of equal value to the dog. The speech centre and chief supremacy centre are in the left, and profit by the corpus callosum commissures. The acts associated with will and training are instinctive acts and not so much in proportion, according to Dr. Levi Vallensi, who has been working in Professor Raymond's laboratory.

The growth of the corpus callosum marks an advanced stage or phase in the mechanism of thought, and the evolution of the group or individual. It indicates a perfecting which is accompanied by the location of psychism in the left ventricle. (4) Semidecussation, which is realized by the sense organs, and is best exemplified by the optic commissure, is an important method of promoting conjoint action. The facility for promoting conjoint action favours unilateral action also, and the emphasizing of contrasts which play an important part in the life of the individual.

Bardeleben mentions that the seat of language, method, is in all cases the pars opercularis, Broca's convolution, but sometimes also the hinder half of the pars triangularis. Schwalbe's convolution corresponds to the pars orbitalis. The protuberantia frontalis corresponds to the pars orbitalis. The protuberantia frontalis corresponds essentially to the region of the planum temporale that belongs to the frontal bone. The speech centre is further back, and, when swollen with blood, impresses the skull at the anterior inferior angle of the parietal bone. The sulcus spheno-temporalis has an eminence in front and behind. The pars triangularis and the adjacent part corresponds to the anterior eminence, and the pars opercularis behind both. One would expect that difference on both sides of the skull would be distinguishable. This is possible in some heads of the living.

Variations in the extremities have been noted. In the *arteries*, 61 cases (Quain) of high division of brachial; 43 on one side only; 13 on both sides.

Stieda emphasized the importance of the interosseous artery, which had four high origins, all right, when dealing with abnormalities.

Veins.—Barkow's plates show some variations in superficial veins, but much material is required before one can make estimates. Veins in the axilla vary a good deal (Robinson). It is sometimes pointed out that the right arm is at a very early period larger than the left. And Godin says that the right arm and forearm at the age of 13 years are larger than the left. The right-handed in the old time used the left foot more than the right. It is possible that the measurements, as has been suggested, relate to the sternum, and that inquiries should be made with reference to the frequency of the use of the left hand in dextrous operations. The left hand is used in ways that require some training and skill. Where the two hands are used, as in some operations, it may be a question sometimes which hand is most skilled. Whatever may be said for the training of the hand carefully and the value of uniformity and specialization, it may be pointed out that many operations are begun and are conducted by the right hand under the eye as guide and register. In the course of time automatism is apt to become established in a greater or less degree, and then if the operation of the right come to lack precision, the training of the left hand may diminish the risk of overworking certain brain centres. The statistics presented to the Anatomische Gesellschaft showed that 4 per cent. of the German soldiers examined (about 250,000) were left-handed. Since this the extension of the inquiry to other groups showed, as indeed v. Bardeleben had anticipated, a much larger percentage.

DISCUSSION ON
THE ANATOMY OF THE NORMAL STOMACH.*

OPENING PAPER.

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THE earlier anatomists studied structure with but little reference to function; they were content to describe an organ as it appeared after death. In recent years anatomists have concerned themselves more and more with the relationship between structure and function; they have attempted to discover the anatomy of organs as they exist in life. It soon became recognized that the flaccid sac which is generally found *post mortem* (Fig. 1) differs greatly from the living stomach, but many years elapsed before a method was discovered which made it possible to investigate the anatomy of the stomach of living individuals. The methods employed by physicians in examining the stomach were of no assistance. Percussion, for example, only shows the extent and position of the gas present, but as there may be excess in a small stomach and very little in a large stomach, no information as to the size of the organ itself is obtained. Recent investigations with the *x* rays have shown, moreover, that auscultatory percussion yields entirely untrustworthy

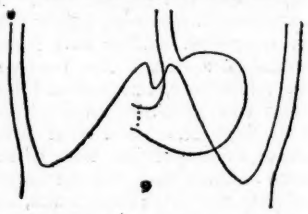

Fig. 1.—"Normal" stomach traced from a textbook on *Surface Anatomy*, 1911.

* This discussion took place at a combined meeting of the Section of Electro-Therapeutics with the Section of Anatomy, the President of the latter Section (Professor William Wright) occupying the chair.

results, although it was believed at one time that in this there had been discovered a means of estimating the exact size and position of the stomach. Modern surgery also has added nothing to our knowledge of the anatomy of the stomach, for the stomach seen in the operating theatre hardly differs from that seen in the dissecting room. The examination in both cases is made in the horizontal position, and an anaesthetic generally gives rise to the same relaxation of tone that occurs after death.

From time to time anatomists have described stomachs in which a certain degree of tone had been maintained after death. Recognizing that such stomachs must approximate more closely to the normal than those generally met with, an attempt was made to fix the stomach in its natural condition immediately after death by filling it with formalin and by freezing it. The former method has been criticized on the ground that formalin might give rise to contractions which did not exist in life, and both methods had the obvious drawback that they fixed the stomach in the form present immediately after death, which in the large majority of cases is very different from that present during active life, as in the last hours of a fatal illness the stomach probably becomes atonic and dilated. In those cases in which death is sudden this fallacy is no longer present, but it is replaced by another, as the depressions caused by peristaltic waves, which in life are constantly moving towards the pylorus, are fixed and are likely to be mistaken for permanent indentations. In spite of these fallacies, the investigations carried out on formalin and frozen specimens prepared the way for the acceptance of the results obtained with the *x* rays, and they yielded information concerning the structure of the pyloric end of the stomach which could have been obtained by no other means.

The discovery that bismuth salts could be safely mixed with food in sufficient quantity to render it opaque to the *x* rays opened a new era in the investigation of the anatomy of the stomach, as for the first time it became possible to see the stomach under natural conditions, both in the vertical and horizontal positions.

Before accepting the results obtained with the *x* rays, it is necessary to inquire into the possible fallacies of the method. In the first place it has been suggested that the salts of bismuth, by acting chemically upon the mucous membrane, reflexly influence the tone of the muscular coat. It has also been supposed that the weight of the bismuth salts added to the food might cause distortion of the stomach. Both of these possible fallacies have been shown to be non-existent by examining individuals who were so thin that a single gram of bismuth salt added to the food was sufficient to render the stomach visible with the *x* rays. It was invariably found that the outline of the stomach was the same whether the food contained 1 gram or 100 grams of the salt so long as its tone was normal. When atony was present, the greater curvature was somewhat lower with the larger quantity of the salt than with the smaller quantity, but this is of no importance in connexion with the normal stomach. Any possible fallacy resulting from the action of the salt on the gastric juice can be prevented by using the inert oxychloride instead of the alkaline carbonate of bismuth.

The distortion produced by the divergence of the rays is prevented by using the fluorescent screen instead of skiagraphy, as when a very small aperture is made in the diaphragm, only the central and almost parallel rays are employed. I have further diminished the error by placing a vertical and a horizontal wire across the diaphragm in such a way that the central rays pass through the point where they cross. If the tube is moved about so that the shadow of the crossed wires coincides with each point of the outline of the stomach, as it is traced upon the screen, no distortion can be present. By using the screen instead of skiagraphy, it is also possible to distinguish permanent from temporary depressions in the surface of the stomach. On several occasions when I have been asked for an opinion about a skiagram, which was supposed to show an hour-glass constriction of the stomach, a screen examination was subsequently made, and demonstrated that the stomach was normal and that the skiagram had caught a deep peristaltic wave in one point of its course towards the pylorus, thus repeating the error already described in connexion with the formalin and freezing methods of fixing the stomach.

Another very important point to remember in connexion with the *x*-ray investigation of the stomach is that the shadow thrown on the screen represents its outline projected on to a flat surface, although the stomach is neither a flat organ nor does its axis lie in a single plane. The image obtained with the *x* rays, therefore, requires correction with the aid of the information obtained by the ordinary anatomical methods.

In the writings of some of those who have interested themselves in the *x*-ray examination of the stomach, the assumption is made that a description is required of the stomach filled with the particular meal which the investigator is in the habit of giving the individuals he examines. In this he is repeating the error of the older anatomists, who did not distinguish between the anatomy of the empty stomach and that of the full stomach. What is really required is a knowledge of the shape, size and position of the empty stomach, of the stomach after the consumption of a special bismuth meal—which is required as a standard with which abnormal stomachs can be compared, and finally of the stomach after a large meal has been eaten. On comparing the stomach when filled to different degrees, it becomes evident that it adapts itself by variations in the tone of its muscular coat to the bulk of its contents, so that the intragastric pressure remains constant and the level of the upper limit of the gastric contents in the erect position does not alter with changes in their bulk.

What I shall therefore attempt to describe is the average shape, size and position of the stomach in healthy adults when empty, when half-filled with a standard bismuth meal, and when full, in the vertical and in the horizontal positions. As the depressions caused by peristaltic waves are only temporary, they must be ignored. Such a description of the stomach is certainly somewhat artificial, as peristalsis normally begins as soon as food enters the stomach and continues until the organ is empty. But so long as this fact is recognized, greater accuracy is obtained than is possible if depressions are described, which only represent what is seen at a given moment, the picture being completely altered a few seconds later.

My information is derived from my own *x*-ray investigations, amplified and confirmed by those of other workers, with the gaps left by this method filled in by the results obtained by anatomists with the formalin and freezing methods. The nomenclature I have adopted is that used by Cunningham and is mainly due to His and Jonnesco. It has the advantage of being perfectly definite, and its universal adoption by anatomists, physiologists, pathologists, physicians and surgeons would put an end to the state of confusion which exists at present in descriptions of the stomach in health and disease. I may mention at once that the term "pyloric antrum" has been discarded, as it has been employed with so many different meanings that its retention can only lead to confusion. I shall not refer by name to any authorities, but I desire now to express my indebtedness to the pioneer work of Cunningham, Symington, Birmingham, Jonnesco and Eric Müller amongst anatomists, and of Barclay, Thurstan Holland, Rieder, Groedel, Holzknecht, Béclère, Leven and Barret and Pfahler amongst a host of others, who have investigated the anatomy of the stomach with the aid of the *x* rays.

The Subdivisions of the Stomach.

The oesophagus enters the stomach very obliquely, the acute angle it forms being called the *incisura cardiaca*. The cardiac orifice, though not surrounded by a definite sphincter, has a much smaller diameter than the lower extremity of the oesophagus, as great a period being consequently required for the passage of a mouthful of food through the cardia as for its passage down the whole length of the oesophagus.

The stomach can be divided into a larger *cardiac part* and a smaller *pyloric part*. The cardiac part consists of the *fundus* and *body*, the fundus being the segment of the stomach which lies above a horizontal plane passing through the cardiac orifice. The body is situated entirely to the left of the middle line. In the erect position it is either vertical or, especially in men, slightly inclined towards the right; in the recumbent position it is always rather more oblique. Its axis is inclined forwards as it passes downwards.

The *incisura angularis*, a well-marked depression on the lesser curvature, most obvious in the erect position, separates the body from the pyloric part of the stomach, but there is no definite depression on the greater curvature marking the separation.

The pyloric part of the stomach consists of the *pyloric vestibule* and *pyloric canal*, the termination of which is the *pylorus*. The pyloric vestibule is directed upwards and slightly backwards as it turns towards the right; it generally reaches just beyond the middle line. The pyloric canal is about 3 cm. in length; it is directed more directly backwards than the pyloric vestibule, but is inclined slightly upwards and to the right. Its termination projects into the duodenum, producing a striking resemblance to the portio vaginalis of the cervix uteri. The position of the pylorus is only occasionally marked by a slight constriction on its outer aspect; it can be more readily recognized by a venous ring, the position of which

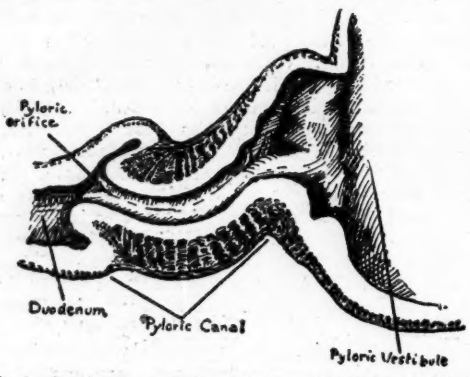

Fig. 2.—Section through the pyloric part of the stomach of a child aged 2 years. (After Cunningham.)

corresponds closely with it. Both the circular and longitudinal muscular coats are much thicker round the canal than in the rest of the stomach. The circular fibres are disposed in the form of a sphincter, which attains its greatest development at the duodeno-pyloric junction, where it is separated by a connective tissue septum from the circular coat of the duodenum. Only a few of the more superficial longitudinal fibres are continuous with those of the duodenum, the majority forming distinct fasciculi, which penetrate the substance of the sphincter, in which some end, whilst others reach the submucous tissue (Fig. 2).

1. *The Empty Stomach* (Figs. 3 and 4).—In the empty condition the upper third of the stomach is pear-shaped and contains gas. The rest of the organ passes to the pylorus in the form of a collapsed tube. The pylorus is situated in the transpyloric plane—midway between the upper margin of the manubrium sterni and the upper margin of the symphysis pubis in the middle line or very slightly to the right. The greater curvature in the erect position reaches the level of the umbilicus or slightly above it. In the horizontal position the stomach lies more

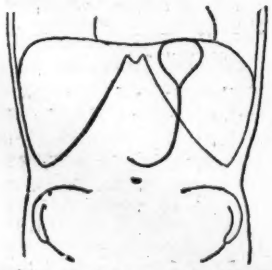

Fig. 3.—Lumen of empty stomach in vertical position, as defined with the *x* rays.

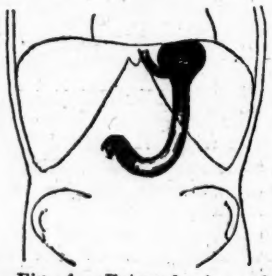

Fig. 4.—External view of empty stomach in vertical position.

obliquely, and the greater curvature scarcely reaches below the pylorus.

2. *The Half-filled Stomach* (Figs. 5, 6, 7, and 8).—When the stomach is partially filled by a standard bismuth meal, half a pint in volume, its body is almost uniform in diameter, and its axis corresponds in position with that of the empty organ. As the diameter of the fundus is rather greater than that of the body, a slight constriction marks the separation between the two parts of the stomach. The diameter of the pyloric vestibule becomes slightly smaller as it approaches the pyloric canal. The pyloric canal is always closed, except when chyme is passing

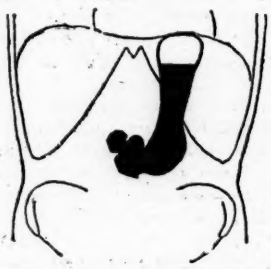

Fig. 5.—Stomach as seen after a bismuth meal, showing depression, produced by peristaltic waves.

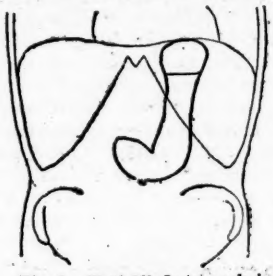

Fig. 6.—Half-filled stomach in vertical position, as seen with the *x* rays, the depressions produced by peristaltic waves not being shown.

Fig. 7.—External view of half-filled stomach in vertical position. I.C. = incisura cardiaca; I.A. = incisura angularis; P.C. = pyloric canal.

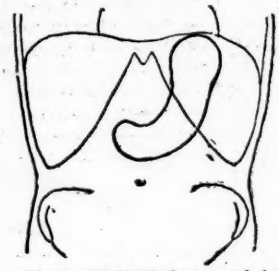

Fig. 8.—Half-filled stomach in horizontal position, as seen with the *x* rays.

through it into the duodenum, although its cavity is generally more or less expanded in *post-mortem* specimens. Even when the sphincter is relaxed for the passage of food, the canal is so narrow that nothing more than a very fine line can be seen with the *x* rays joining the gastric and duodenal shadows.

In the vertical position the greater curvature almost always reaches below the umbilicus, the average distance being 2½ cm. in men and 5 cm. in women. In the horizontal position the greater curvature is on an average 6 cm. higher, its lowest point being consequently above the umbilicus. The junction between the horizontal and descending portions of the duodenum is fixed, but the pylorus is mobile, and in the half-filled stomach it is situated distinctly lower in the erect than in the recumbent position. The fundus does not drop from the diaphragm when the erect position is assumed, but, as as the diaphragm itself falls slightly, the fundus is also a little lower in the vertical than in the horizontal position.

3. *The Full Stomach* (Figs. 9, 10, and 11).—Owing to the greater resistance of the structures in contact with

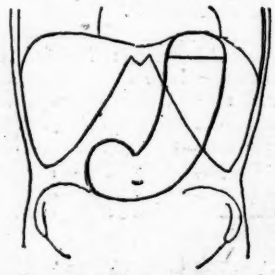

Fig. 9.—Filled stomach in vertical position, as seen with the *x* rays.

Fig. 10.—External view of filled stomach in vertical position.

the lesser curvature than those in contact with the greater curvature, when the stomach is filled with a large meal its walls expand more in the direction of the latter than the former, so that its axis comes to lie outside and below that of the empty and the half-filled stomach. (Fig. 12.) The left dome of the diaphragm is pushed upwards until it reaches as high as, or higher than, the right dome. The diameter of the body of the stomach is so greatly

increased that the constriction between it and the fundus disappears. The collection of gas—the "Magenblase" of German radiographers—is wider and more shallow than that of the half empty stomach. The diameter of the

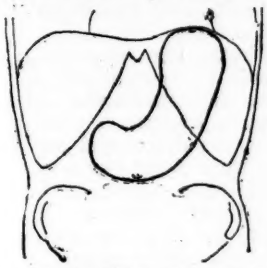

Fig. 11.—Filled stomach in horizontal position, as seen with the *x* rays.

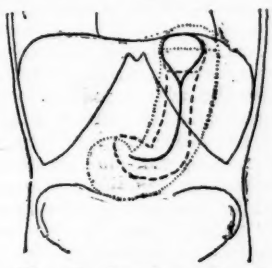

Fig. 12.—Superimposed outlines of empty, half-filled, and full stomach, as seen with the *x* rays, in the vertical position.

body is uniform; that of the pyloric vestibule is almost as great as that of the body, but it diminishes as it approaches the pyloric canal, which invariably remains closed. The pyloric vestibule is so greatly widened that it reaches considerably beyond the middle line, and when viewed from the front completely hides the pyloric canal, which now points either directly backwards, or even slightly towards the left, in spite of the fact that the pylorus itself also moves slightly towards the right.

DISCUSSION.

Professor WILLIAM WRIGHT (President of the Section of Anatomy) thought that the bag-shaped stomach which was described by anatomists until a few years ago had now been entirely given up for a more modern view. The discussion that morning should be chiefly on two points, which, however, were not quite separate. The first was as to the shape of the stomach, the second as to its position. They were very much connected. As to shape, anatomists were to some extent out of court in this matter. The last word did not rest with them. Their observations were always made upon organs which had been subjected to formalin, and with formalin there was always the danger of a great fallacy. Formalin selected out certain fibres which it stimulated more than others. Nevertheless, so far as he could see, the chief difference between anatomists and the workers with *x*-ray methods had regard to the pyloric antrum. For his own part, he had always regarded this as rather a vague thing, quite possibly associated with a constriction of the pyloric orifice, and he felt no aversion to adopting the suggestion of Dr. Hertz that the pyloric antrum should be omitted in the description of the normal stomach. As to position, anatomists, perhaps in a roundabout way, could offer an opinion which was firmly based and must be accepted. For anatomists had not only the position of the stomach in the cadaver upon which to base their view, but they had the important inferences which could be drawn from the modelling of such organs as the liver and the spleen, and from the attachment and direction of the transverse meso-colon. These inferences were all in accordance with the view expressed by Dr. Hertz that the cardiac and pyloric portions of the stomach were in different planes, and that while the pyloric portion might be described in broad terms as being in the horizontal plane, the cardiac portion was in the vertical plane. That was a fair compromise between the two views—on the one hand, that the stomach was a horizontal organ, and on the other, that it was a vertical one. The gastric surface of the spleen was such as to suggest the vertical position of the cardiac portion of the stomach against it, while the modelling of the left lobe of the liver close to the pyloric portion of the stomach was in keeping with the idea that the stomach was a horizontal organ. The stomach might, therefore, be spoken of, neither as a horizontal nor as a vertical organ, but as being vertical in its cardiac portion and horizontal in its pyloric portion. Anatomists generally would be inclined to agree with Dr. Hertz's two contentions—first, that the pyloric antrum was not a very constant portion of the stomach, and secondly, that the former description of the stomach as a bag-like organ should be finally rejected for the more tubular form which Dr. Hertz and others had so clearly described.

Professor JOHNSON SYMINGTON, M.D. (Belfast) said it seemed to him that they should attempt to reconcile, if possible, the findings of the anatomist, the operating surgeon, and the *x*-ray worker, and if there were any differences in their results, that they should get at the reason for them. Anatomists desired to send their students to the hospital with a grounding in anatomy which, because of its truth and thoroughness, would enable them to profit to the utmost by the instruction received there. But the anatomical results were not really so different from the results by the *x*-ray method as was commonly imagined. More than thirty years ago the speaker had described the position of the pylorus in the empty contracted stomach, and had stated that the pyloric end of the stomach when it became dilated overlapped the pyloric orifice, which was directed distinctly backwards. With regard to the dilatation of this particular part of the stomach, not only had he specimens illustrating the directing of the pyloric orifice backwards and to the right side, but specimens also in which the pylorus actually pointed to the left. The stomach in that case had turned over towards the right side, reversing the direction of the pylorus and bringing about a complete half-circle rotation. With regard to the general question, he thought it too largely assumed that anatomists had to deal with conditions under which very considerable alterations had occurred in the condition of the abdominal organs. But *post-mortem* changes had to a considerable extent been exaggerated. As the speaker had shown in an anatomical exhibit in which he had hardened the whole of the abdominal and pelvic viscera and had displayed the organs contained within the abdomino-pelvic cavity, the alterations were not so great as was supposed. The posterior abdominal wall was fairly rigid, and the essential changes were those connected with the anterior abdominal wall, which of course was constantly moving during life. What occurred after death, as a rule, was an elevation of the diaphragm and a compensatory retraction of the anterior abdominal wall. Coming to the individual organ, he said that those of them who had been working of recent years more especially with the formol bodies, found that all the typical conditions described in connexion with the stomach were very frequent. The various conditions of the stomach which Professor Paterson had illustrated on the walls of the room that morning* were not permanent. They represented merely a temporary fixation and not a constant contraction. The stomach was continually varying and rings of contraction passed along it. The results obtained with regard to the hollow viscera after death were not nearly so different from the conditions that probably existed during life as was often believed. For a number of years he had been in the habit of preparing specimens by carefully hardening the entire body. He then reflected the anterior wall, and in the case of any hollow viscera containing gas that he met with he replaced the gas with gelatine, taking care not to alter the general form. He showed in this connexion a typical example of a condition he had met with many years previously—namely, the displacement of the liver as a result of the distension of the stomach. The liver was displaced towards the right side, the small intestine was fairly distended, and the stomach was occupied with gas. He desired to know whether that condition did occur during life. Dr. Hertz had rather implied that during life even the emptied stomach passed nearly vertically downwards and then turned sharply upwards and towards the right. The speaker had come across two or three stomachs lately in which the organ was found after death to be full of blood and presenting the typical position and shape of the ordinary bismuth stomach. During life many people undoubtedly suffered from gaseous distension of the small intestine and transverse colon. Could the *x*-ray worker give them any information as to whether such a condition as he had indicated should be regarded as a *post-mortem* result of the accumulation of gas or whether such a condition might exist during life? So far as he understood, *x*-ray workers always found that after a bismuth meal the stomach extended down below the umbilicus. It was possible that the contents of the stomach might displace and

* See later in this discussion.

push aside the intestines, but it was a point of some interest to know what was likely to occur. Of course, there was another aspect of the stomach which Dr. Hertz recognized, namely, the side view. The lateral view-point could not be ignored, because it was quite obvious from the anatomical relations that the fundus of the stomach—the upper portion of the main body of the stomach—tilted very distinctly backwards, and that there was a regular shelf sloping back upon the spleen and kidney and diaphragm, so that the stomach showed a distinct bend backwards at the upper part.

Dr. A. E. BARCLAY (Manchester) said that while they were greatly indebted to Dr. Hertz for the lucidity of his exposition, he noticed that he had not given them anything of the physiology of the stomach. The physiology and anatomy of the stomach were so wrapped up together that a proper conception of the one could not be obtained without the other. Perhaps on some future occasion Dr. Hertz would open a discussion on the gastric physiology. Moreover, a very large number of cases were required in order to arrive at a conception of the normal stomach, and Dr. Hertz had done well to superimpose the outlines of several examples on the screen. From the anatomical point of view, the graphic presentations were very difficult to understand, but the variations that arose between life and death were most interesting. He referred to a case related by a Liverpool physician in which an operation was performed upon a negro. The stomach in this instance was so thick-walled and hard that it was with the utmost difficulty that a gastro-enterostomy was done. The wall of the organ was said to be as thick as the little finger. The man died, and at the *post-mortem* examination a great "blotting-paper" stomach was discovered, thus showing the variation that might take place between life and death. A point worth making in this connexion had regard to the level of the diaphragm, which was at about the tenth or eleventh dorsal vertebra, and not the eighth or ninth, as it was found *post mortem*. The diaphragm after death thus rose considerably higher than the position it occupied during life. When a large quantity of food was taken—a patient of whom the speaker produced a radiograph had a kink in his mind about his digestive apparatus, and conceived it to be necessary to take a large amount of food—the administration of 4 pints of bismuth food with 8 oz. of bismuth brought out clearly in the radiograph the fact that the left side of the diaphragm was pushed up and reached to the level of the right side. In that case also the pylorus could actually be seen, and the distance between the pylorus and the cardiac orifice was still more or less fixed; whereas, in a case of gastroptosis, of which he showed a radiograph, the pylorus was considerably lowered, the lesser omentum was elongated, and the distance between the cardiac orifice, and the pylorus was much increased. [Dr. Barclay accompanied his remarks by an exhibition of radiographs, one showing a hypertonic stomach, exhibiting very active peristalsis and emptying exceedingly rapidly. The position of the pylorus was indicated by a separate bolus, which was persistently seen in the duodenum. The other radiograph represented the case described in which the stomach was filled with 4 pints of bismuth food. The stomach was really slightly atonic, and the large quantity had filled up the whole organ and had given it the normal shape, although the ordinary small quantities sank to the bottom in the usual manner.]

Mr. H. J. STILES (Edinburgh) said that there was one point which had impressed him very forcibly in the course of the discussion, and that was, as the previous speaker had stated, the impossibility of properly studying the anatomy of the stomach without studying its phyiology and vice versa. What physicians and surgeons had to do was to study the physiology of the stomach, and to correlate that with such anatomical appearances as were presented by the *x* rays. If the practitioner attempted to read the *x*-ray picture without a proper conception of the physiology and anatomy of the stomach he was extremely liable to be deceived. He related a case in which the *x*-ray appearances of the normal full stomach were mistaken for those of an atonic and dilated stomach. The speaker thought it quite time that anatomists and clinicians should teach the student the *x*-ray appearances, because, after all, these were in many respects more important than the appearances seen in the dissecting-room or on the operating table. As a surgeon, he scarcely ever found the stomach in the operating room to present the form commonly shown in the skiagram. The *x*-ray picture was made usually in the vertical position after a bismuth meal; the surgeon, on the other hand, viewed the stomach in the horizontal position in an empty condition, which made a very great difference. With the patient under chloroform the stomach was seldom physiologically active; therefore, under such a condition it represented much more closely the position and appearance of the *post-mortem* stomach than of the physiological stomach during life. The question of gas in the stomach had been raised in the course of the discussion. When the patient was in the vertical position the gas rose towards the fundus of the stomach. But some of them might have had the opportunity of examining the stomach in the case of a little child who had occupied the horizontal position for twelve months owing to spinal disease. Here would be observed a condition which looked, and which might be regarded clinically as, quite abnormal. The stretching of the abdominal wall which was noticed under such circumstances was due simply to the gas rising towards the anterior of the stomach and pushing the epigastrium before it. If the patient happened to die, the *post-mortem* appearances would probably be similar to those which Professor Symington had shown to exist in his specimen. The speaker desired some information as to the position of the pylorus. It was important, in his judgement, to determine whether the pylorus was as fixed as it was commonly supposed to be. In the majority of cases of the so-called normal stomach it was said that the pylorus was fairly fixed, but he believed, on the other hand, that in the atonic stomach the pylorus came down, and that there were all transitions between the normal and the atonic stomach, the pylorus getting gradually lower and lower with the increasing atony. Dr. Hertz had spoken of the pyloric canal, but this as a rule was not seen by the surgeon in the normal stomach. The transition between the pyloric canal and the body of the stomach was usually less and less marked as the stomach became atonic, and even the pyloric ring was generally less marked in that condition. With regard to the pyloric antrum and the pyloric vestibule, the speaker said that he did not believe much in the pyloric vestibule. A projection of the pyloric antrum towards the right was specially seen when there was a stricture of the duodenum or pylorus. The degree to which the pyloric antrum passed to the right of the middle line was worthy of attention. He described the very great variations in the form of the casts which he made some years ago by filling the stomachs in the dissecting room with plaster of Paris. In chronic constipation the transverse colon, in his opinion, had a great deal to do with the dropping of the stomach owing to its dragging tendency upon that organ.

Professor A. CAMPBELL GEDDES (Dublin) said that a point of some importance in the discussion was that all the *x*-ray photographs of the stomach were of necessity taken with the abdominal wall in a position of rest more or less complete. He thought it necessary to consider the abdominal wall in action. There was no doubt that the shape of the abdominal cavity in a man who was standing still was very different from its shape in a man who was actively moving. When a man was erect, in active, forceful movement, and breathing deeply, the abdominal wall occupied a position of contraction. He showed a graphic reconstruction of the abdominal cavity as it apppeared when the muscles were contracted, and therefore as it was presumably during active life. In this it was almost of an hour-glass shape in the sagittal plane. In the centre of the cavity, directly in front of the lumbar convexity and aorta, was an area which was absolutely devoid of viscera, the great omentum alone intervening between the anterior and posterior abdominal walls. This vacant area no longer existed when active movement ceased, for it then became occupied by a portion of the stomach, which sank downwards as soon as the individual came to rest in the erect attitude. In support of this view the speaker discussed the position of the transverse colon in relation to the activity of the abdominal musculature generally. He showed also a graphic reconstruction

of the female abdomen. In all females, especially in those who had borne a number of children, the stomach tended to be brought down into the lower compartment of the abdominal cavity, whereas in the muscular male—the man who had died in his prime—it was found that the stomach was more highly placed. It seemed to him necessary to recognize that although they had, as a result of radiography, a great amount of new knowledge as to the shape and position of the stomach in the erect and horizontal attitudes, the anterior abdominal wall, when in active movement, influenced most profoundly the position and, to some extent, the shape of the abdominal viscera. Radiography could not demonstrate the effects of these influences, and the most hopeful line seemed to be carefully to study abdominal wounds made by high-velocity small-bore bullets. Such wounds often indicated that the position of the viscera at the moment of wounding was different from that disclosed by radiography.

Professor A. M. PATERSON (Liverpool University) sent a note on the subject under discussion, which was read by Dr. W. P. Gowland. It was accompanied by an exhibition of diagrams of twenty stomachs taken from the dissecting-room. The normal human stomach, Professor Paterson said, was doubtless subject to many extraneous anatomical and physiological influences whereby variations were produced, and there were doubtless also individual variations of a permanent character. One factor which was responsible for the very remarkable difference in the form of the organ as they saw it in the dissecting-room to-day from that presented thirty years ago, was the method of injection and preservation. Whether or not the unstriated muscular tissue of the organ retained its vitality for a period after death, and reacted under the influence of formol or carbolic acid, it was certain that the normal stomach in cases preserved by means of one of these reagents presented a differentiation of parts which was rarely seen in the days when corrosive sublimate was used as the preservative. One was now accustomed to find dilatations and constrictions in the walls of the organ associated with a greater thickness and accumulation of muscular tissue in the one case, and a thinning out of the muscular coat in the other. It might be that the heaping up of muscular tissue was merely a *post-mortem* fixation of a physiological state, but it was more than probable that it represented an actual anatomical thickening of the wall in which it occurred. Turning to the twenty diagrams exhibited, the writer pointed out that the typical form, presented by the majority of the examples, showed a four-chambered organ, comprising fundus and cardia, pyloric vestibule, pyloric antrum, and pyloric canal. The separation formed by the pyloric vestibule between cardia and pyloric antrum varied in different cases; it might be a definite canal, or it might be a deep V-shaped constriction of the greater curvature (hour-glass contraction). The commonest variation from this type occurred in several cases by the repression in part or wholly of the pyloric antrum, leading to a confluence of the thick-walled pyloric vestibule and pyloric canal. Less common was the form in which the pyloric vestibule was absent, so that the cardia and pyloric antrum were merged into one chamber. There were in the series two examples of extreme conditions—one in which the whole organ was contracted into a thick-walled tube between oesophagus and pylorus with a small thin-walled fundus in the left of the oesophageal opening, and the other in which the whole organ was distended and only a small constriction was found near the pylorus. Thirty years ago this last example would have been described as a normal stomach, and the typical stomach would have been accounted pathological. Jonnesco, Cunningham, and many others had suggested modifications by the introduction of the terms "incisura angularis" and "sulcus intermedius," by which the four parts named were differentiated; but these notches were by no means stable or reliable indications of the separation of the parts of the stomach. Physiologically there was little doubt that there were two essential parts of the stomach—the cardia and the fundus on the one hand and the pyloric portion on the other. It was interesting to speculate on the anatomical factors which were engaged in producing the varieties seen. Dismissing the examples of extreme conditions, to which he had just alluded, and in which physiological or pathological causes might have been at work, it was clear that the changes in the form of the stomach occurred in the pyloric portion and along the greater curvature. No doubt the proximity of other abdominal organs helped to support the stomach and to maintain it in position. There were two factors which appeared, however, to have the greatest influence in determining its form. In the first place, the stomach was slung between two fixed points—by the oesophagus on the one hand and by the connexions of the pylorus and first part of the duodenum on the other. Between these two points—and it was very remarkable how nearly constant, whatever the shape and size of the stomach, was the distance between the oesophageal and pyloric openings—the stomach sagged, and there were few alterations in the usually concave form of the lesser curvature. Alterations, dilatations, and constrictions occurred along the more mobile and plastic greater curvature. In the second place, in the resting state, sitting or recumbent, the stomach was bent across a projection formed by the vertebral column and the structures lying on it—diaphragm and aorta—so that a dumb-bell-like dilatation could take place in the lateral hollows, with the pyloric vestibule as an isthmus between them. An hour-glass stomach was obviously not of necessity pathological. It was the form most frequently seen in the dissecting-room. Its presence might readily lead to fallacies in *x*-ray work, in the event of bismuth-laden material gaining a lodgement, on one occasion in the cardiac, and on another in the pyloric portion of the organ.

REPLY.

Dr. HERTZ, in replying on the discussion, dealt first with Dr. Gowland's demonstration (for Professor Paterson). The graphic reproductions of the stomach which accompanied it, he said, brought out exactly the point he had made in his paper—namely, the mistake made by some anatomists in regarding temporary depressions—depressions which were simply peristaltic wave effects—as permanent features. Secondly, he thought that not sufficient distinction had been made between the full and empty stomach. The conclusions to be gathered from such a demonstration obviously depended to a very great extent upon the fullness or emptiness of the organ. The term "sulcus intermedius" had been used in the note read by Dr. Gowland, but the speaker had found such confusion existing among anatomists as to its precise meaning that he thought it would be advantageous to drop the term entirely. Professor Symington had certainly suggested an ideal way in which anatomists and radiographers could work together. It was most interesting to hear of his accurate description of the pylorus arrived at more than thirty years ago. The same gentleman had said that under many conditions he found *post-mortem* bodies presenting appearances not greatly different from those seen by means of the *x* rays. Such *post-mortem* appearances might be accepted so long as it was realized that the depressions might represent peristaltic waves, and so long as sufficient distinction was made between the empty and the full stomach. It was necessary also to remember that one was examining the *post-mortem* stomach in the horizontal position, whereas two-thirds of the life of the individual was spent in the vertical position. It was very necessary, he thought, to teach the anatomy of the vertical human being. The stomach of a child was different from that of the adult. He believed that the horizontal stomach was found very frequently on an *x*-ray examination of young infants. It was the assumption of the vertical position after infancy that gave rise to the vertical stomach. Professor Symington's remarks about the side view of the stomach were extremely useful, and this was one of the points that he referred to in speaking of the radiographer's interpretation of his picture. With Dr. Barclay he was in entire agreement, but there was one point in connexion with what that gentleman had said that he wished to mention. He thought it important to recognize that the stomach was not divided into two functionally different parts. He agreed with the view that had been expressed by Mr. Stiles, that the examination of the stomach and intestines by means of the *x* rays ought to form part of a practical course at the medical schools. He had made attempts at Guy's to give such demonstrations to the physiological and anatomical students. It was so easy and so admirable a thing that radiographers or physicians

and surgeons who took an interest in the subject should certainly initiate a course for the physiological student. Mr. Stiles had referred to the fixation of the pylorus. The speaker did not think that the pylorus was fixed. The pyloric canal seen in cases of hypertrophic pyloric stenosis in infants was simply an exaggeration of the normal. He did not agree, however, that the pyloric canal disappeared in atony. It might appear so at operations, but in atony the tone of the stomach was entirely independent of the peristalsis, and with the activity of the peristalsis went the activity of the pylorus. He expressed himself in considerable disagreement with Professor Geddes, because he thought that the anatomist far less than the radiographer was able to examine individuals during active life, and it was really impossible to say that reconstruction from *post-mortem* specimens in any way represented the condition during activity. He thought that Professor Geddes was incorrect in what he had said about the position of the stomach. The stomach certainly rose upon the contraction of the abdominal muscle, but it did not otherwise alter its size or position. From examinations he had carried out he had found very little difference in these respects even when the abdominal walls were contracted as strongly as possible. With regard to the colon, it was not correct to say that it was always above the umbilicus. He related particulars of an examination carried out upon twenty-five Guy's students in the vertical position and in the horizontal position, and not in one case was the transverse colon above the umbilicus in the vertical position, and hardly ever in the horizontal position.

SECTION OF PHYSIOLOGY.

Professor J. Smyth Macdonald, B.A., L.R.C.P., President.

PRESIDENT'S INTRODUCTORY REMARKS.

Professor J. S. Macdonald, after expressing a welcome to those present, initiated the proceedings of the Section by giving two short demonstrations, one dealing with the inter-relations of the serum and red cells of blood, and the other with the phenomenon of simultaneous contrast. He then called upon Dr. Mott to commence the discussion on the bio-physics and bio-chemistry of the neurone.

DISCUSSION ON THE BIO-PHYSICS AND BIO-CHEMISTRY OF THE NEURONE.

OPENING PAPERS.

I.—F. W. Mott, M.D., F.R.S.

Introduction.

The nervous system consists of complex branching cells, which in the embryonic state, like the cells of other organs, are confined within microscopic limits, but the inherent specific energy of each neuroblast is manifested by a tropism, a chemical or physical attraction by which extensions of the cell occur, one to form the axon, the other the dendrons. These tropisms have been slowly elaborated and fixed in the process of evolution and adaptation to environment, so that an inherent affinity between a sensory neurone and its peripheral receptor, a motor neurone and its effector, and between these and the appropriate association neurones, has been established permanently. The older phylogenetically and ontogenetically these tropisms, the more fixed and stable have they become. The neurones have thus developed increasingly complex and functionally correlated systems, groups, and communities as we rise in the animal series. Yet the bio-physics and bio-chemistry of a simple nervous system of a lowly organism is fundamentally similar to that of the higher forms.

Unlike other cells of the body, the neurone is a perpetual cell, and incapable of regeneration in the higher vertebrates; all the neurones are present at birth, arranged in systems, groups, and communities, each with a specific energy and durability determined by ancestral inheritance, awaiting the stimuli for their functional development. The truth of this is obvious, from everyday experience; but that inherent specific energy is the determining factor in the *durability* of the neurone is shown by the fact that in certain familial diseases of the nervous system a premature decay and loss of function of correlated systems of neurones occur at a particular age in a number of members of a stock in several, and sometimes successive, generations. We may seek an explanation of this in a failure of the germinal determinants of the nervous system. The metabolism of the neurone is presided over by the nucleus; it may therefore be assumed that the failure of nutritional equilibrium is due to a lack of some bio-chemical or bio-physical condition of the nucleus.

When we consider the extraordinary inherent potentiality of the nuclear matter of the male and female gametes, it is conceivable that the nuclear substance of the neurone possesses a potentiality whereby each functionally differentiated system of neurones inherits a specific bio-rhythmical character enabling it to react physically and chemically to particular modes of motion caused by biological stimuli essential for the preservation of the individual and the species. A bio-rhythm affecting widely separated groups of functionally correlated neurones, causing liberation of nervous energy in the reaction to the stimulus, would not then depend upon its strength so much as upon its biological usefulness.

The existence of two different types of neurone, as was first shown by Golgi, is characterized by the fact that the axon of one type never leaves the grey matter. According to von Monakow, these neurones (of the second type of Golgi), or *Schaltzellen*, are always interposed between the terminals of the axons of one neurone of the first type and the dendrites of another. In contradistinction to the neurones of the first type, the axons of which leave the grey matter and are destined to discharge functional energy, elaborated in the cells of the grey matter, or in a peripheral structure—these small neurones of the second type of Golgi are for the elaboration and local distribution and discharge of energy; indeed, Cajal maintains that the action is of a reinforcing nature; they might therefore be regarded as accumulators and condensers of energy; and not only would they serve to increase the discharge of stimuli, but also to lengthen the discharge. It is not surprising, therefore, that the neurones of the second type of Golgi are found in great abundance in the sensory receptor and perceptor centres of the cortex and the cerebellum. There is no essential difference in the structure of the neurones of the first type, but there are many different forms of neurones peculiar to the functionally different structures; indeed, a comparative histological examination of the cortex in the animal series exhibits differences and similarities in the extent of areas of various forms of neurones and arrangement in layers, in accordance with similarities and differences in modes of adaptation to environment. All the evidence, therefore, tends to the demonstration of the correlation of structure and function in the nervous system.

All neurones consist of a nucleus surrounded by a cytoplasm with branching processes. The neurone, when examined in a living state, produces a profound difference in our conception of its structure to that obtained by a microscopic examination of sections of nervous tissue after fixation and staining. Neither neuro-fibrils nor Nissl granules can be seen in the living cell; in fact, we must come to the conclusion that they are due to death changes, and therefore should be regarded as artifacts. No one, however, will be foolish enough to deny the great advances which have been made by the introduction and employment of methods for showing these structures, in the study of the normal anatomy of the nervous system, and the morphological changes occurring in degeneration and regeneration of the neurone, whether due to poisons, disease, or injury; but in my judgement the conception of the living neurone possessing fibrils and Nissl bodies may lead us astray regarding the bio-physical and bio-chemical conditions that really occur during life in the constituent colloidal substances of the neurone incidental to its functional activity and interaction with the circumambient medium occasioned by particular modes of motion acting as stimuli in vital action and reaction.

Having thus briefly introduced the subject, I will pass on to facts in support of this statement.

Microscopic Examination of the Living Nerve Cell.

We can examine the living nerve cell in an isotonic medium—for example, the blood serum or cerebro-spinal

fluid of the animal. In the case of a warm-blooded animal I have used an apparatus which enables me to keep the preparation at the temperature of the body while under microscopic examination. The apparatus is a chamber with a glass front in which the microscope is placed. The microscope rests upon a metal plate covered with asbestos, which is heated by electric lamps. The constant temperature is maintained automatically by an electrical contact regulator, which can be set for any temperature required. By means of suitable resistance the temperature is kept constant within a degree or so of that required.

I have used both direct illumination and the paraboloid reflector with the dark ground illumination. The animals used were guinea-pigs, which have been killed for serum necessary for the Wassermann reaction, and in one case an ox that was slaughtered, and from which a piece of the spinal cord was removed immediately after death and put into a vessel filled with blood. In the case of the numerous guinea-pigs killed I have examined the posterior spinal ganglion cells, the sympathetic ganglion cells, and the cells of the grey matter of the spinal cord. In the case of the ox I only examined the anterior cornual cells.

The appearances presented by all the living nerve cells examined were fundamentally the same. If I knew nothing of the structural appearances of the neurones when examined in fixed tissues to demonstrate Nissl granules and fibrils, I should never suspect their presence in the living cell. I should say I see by direct illumination a viscous homogeneous white-of-egg-looking semi-fluid substance, permeated like a sponge with fine granules which look dark, and obviously have a different refractive index. This appearance was very evident in the multipolar cell of the spinal cord of the ox. These refractive granules were seen extending through all the processes, and were of uniform size. The nucleus appeared to have these granules in it, but I think this was an optical effect due to the nucleus being in the centre of the cell with the cytoplasm in front of it. Moreover, the appearance of a cell membrane of clear homogeneous material was exaggerated through optical effects, and the difficulty of drawing what is really an indefinite line of viscid substance, which alters its appearance by focussing. Posterior spinal and sympathetic ganglion cells show a similar appearance by direct illumination.

I have repeated the observations of Marinesco, Tello, and Ramón y Cajal of examination of the living ganglion cells with the ultra-microscope. Some cells appear more luminous than others on the dark ground, others more diaphanous, and still others intermediary. These luminous granules are the same as appeared dark with the direct illumination. The different degrees of luminosity depend upon the number and size of the luminous granules contained in the homogeneous spongioplasm. The nucleus with its nuclear membrane can sometimes be seen quite distinctly; sometimes it is indistinct owing to the granules lying in front of it. These granules remind one of Altmann's bioblasts, and possibly may be regarded as living elements of protoplasm; according to this theory, the bioblasts would constitute an essential factor in the production and emission of the nervous impulse. According to Marinesco, these luminous granules are in all probability identical with the neurosomes of Held.

The nucleolus may appear luminous; this is, no doubt, due to a difference in the index of refraction of the nucleolus and the nucleoplasm. This fact, as Marinesco points out, may be correlated with the fact that argento-fibril granules are seen in the nucleolus by the Cajal fibril method of almost constant number and dimensions. If the living nerve cells are subjected to the action of water or a weak 1 per cent. solution of ammonia an endosmosis takes place, the cells swell up, water passes through the cell membrane and collects in globules; it does not seem to dissolve the granules, but to be absorbed by the homogeneous spongioplasm; and, as the process continues, semi-opaque fluid droplets appear within the cell and the granules escape into the surrounding medium, where they exhibit active Brownian movements on the dark ground. I have seen the effect of their oscillation on the surrounding fluid as they are being forced out of the cell, in the form of a rhythmical vibration like a minute tuning-fork tracing. The granules are extremely minute—less than 1 μ; they sometimes appear spherical, sometimes oval, in shape. It appears to me that they consist of a colloidal fluid surrounded by a membrane possibly consisting of lipoids. They are seen, though less numerous, in the processes of the neurone, including the axon. Assuming that each granule consists of a colloidal fluid containing electrolytes surrounded by a (lipoid?) film which acts as an osmotic membrane with a surface tension, it is conceivable that they probably play some important part in the generation of nervous impulses.

I have stained the living cells with isamine blue and vital methylene blue; the whole cell was uniformly stained; the nucleus as well as the cytoplasm took up the dye. In one preparation—for they are not easy to make—I succeeded in slowly acting upon the cell with 5 per cent. formalin after it had been stained uniformly with isamine blue, and in one part of the preparation I obtained cells showing the whole of the cytoplasm filled with discrete blue granules; the nuclear membrane was stained blue, and in the nucleoplasm were a number of granules of varying size stained deep blue; these might have passed for chromosomes. The appearance of the cytoplasm of the spinal ganglion cell resembled that of a formol-hardened ganglion cell stained with methylene blue. I concluded, therefore, that these discrete refractile granules may form the basophil-staining substance constituting the Nissl granules. If the living cell be subjected to the action of neutral red ½ per cent. solution in normal saline, it is true, as Marinesco says, that you may have appearances suggesting the existence of fibrils and granules in the living cell; but are we sure that the dye has not killed the cell and produced a coagulation of the colloidal spongioplasm?

Moreover, the work of Butschli and Hardy shows that the foam structure of protoplasm can be produced artificially, and it is more than probable, in my opinion, that the intracellular neuro-fibrillary network which is seen in all nerve cells which have been fixed and stained by the silver method is an artifact. If the luminous granules which we have seen in the cells are the antecedents of the Nissl bodies, how comes it that we can see luminous granules in the axon, for no Nissl granules are seen in the axon of fixed and stained tissues? My answer is, the colloidal fluid of the granule may vary in its chemical composition or its reaction, but the physical properties may be similar; the fluid of the luminous granules of the cell and its dendrons may have a basic reaction, but owing to chemical conditions in the discharge of impulses in the axon the fluid may become acid or neutral, and so is unstained by basic dyes in the hardened tissues.

Experimental and Pathological Changes in the Neurones.

What can be learnt concerning the bio-physics and bio-chemistry of the neurone by a study of (*a*) experimental and (*b*) pathological conditions of the neurone? First, let me briefly refer to the experiments of Ross Harrison, which have placed the neurone doctrine on a firm basis; they also indicate the probability of the occurrence of amoeboidism of the terminals of the axon; consequently they serve to support the view of an alterable conductor due to bio-physical changes in the neurone incidental to functional activity. Harrison placed a small portion of the medullary groove of an embryo tadpole, before there was any trace of cell differentiation, in lymph removed from the lymph sac of a frog; the preparation was put on a cover-glass, and mounted on a hollow slide and sealed with paraffin. The lymph clots almost immediately and holds the transplanted tissue in place. He has kept preparations alive five weeks, and watched the development of the neuroblast, and he has seen the axon develop and grow. A somewhat similar structure to the cone of increase, described by Cajal, by his silver method of staining embryonic spinal cords, can be seen. It probably is similar to the terminal bulb of regenerating axons found in the peripheral stump of a divided nerve. Harrison has observed a growth of 20 μ in twenty-five minutes. Control experiments with other tissues of the embryo gave no such results. These remarkable observations of Ross Harrison show beyond question that the nerve fibre begins as an outflow of hyaline protoplasm from cells situated within the central nervous system. This protoplasm is actively amoeboid, retaining its pseudopodia at its distal end; and the protoplasm

is drawn out into a thread which becomes the axis cylinder of a nerve fibre. Although Harrison has disproved the theory that the sheath cells form the essential portion of the nerve—namely, the axis cylinder—yet he fully admits, as all those who uphold the neurone doctrine do, that the cells of the sheath of Schwann play an important rôle in the nutrition and production of the nerve fibre. These experiments of Harrison place the outgrowth theory of His on the safest of all foundations—namely, that of direct observation. It is, moreover, interesting and important to note briefly that Marinesco, Goldstein, Minea, and Nageotte, have observed in transplanted spinal and sympathetic ganglia of warm-blooded and cold-blooded animals an outgrowth of fibrils from the ganglion cells. As Verworn truly says, the embryological basis of the neurone doctrine has been established beyond dispute. It is probable that the substance which forms the fibrils is the conductile substance; but inasmuch as the phenomena of fatigue show that the nerve when placed under physiological conditions is unfatiguable, whereas experiments show that the nerve cell is fatiguable, it tends to prove that there is another colloidal substance in the cell which is used up in functional activity. Fatigued ganglion cells show nuclear changes and a diminution of the Nissl substance.

The nerve cell, like all animal and vegetable cells, represents "an organized hydrosol" susceptible of being influenced by mechanical, chemical, and physical agencies. Again, all these factors affect the anatomical, chemical, and colloidal mechanism of the nerve cell. If the axon of a neurone be cut, bio-physical and bio-chemical phenomena occur in the nerve cell. If the dendrons of a nerve cell be cut—for example, the cells of Purkinje—bio-physical and bio-chemical changes occur in the cell and the portion separated from the cell. This is as we should expect from the neurone theory; injure a part and the whole suffers.

All the elements constituting the cell take part in this reaction of injury—the colloidal granules, spongioplasm, nucleus, and nucleolus. The nerve cell increases in volume; the nucleus, then nucleolus, and the cytoplasm are affected. Examined by the Nissl method, there is a dissolution of the chromatophil elements of the cell body and dendrons and a displacement of the nucleus. The intensity and gravity of these lesions are proportional to the intensity of the trauma, section, resection, or tearing out of the nerve and the amount of the neurone separated from the trophic centre—the nerve cell.

In the normal living state there is a kind of equilibrium between the circumambient medium and the osmotic tension of cells, but section of the axon causes an increase of the osmotic pressure of the circumambient medium, determining the passage of water into the cell. It may be that this is due to an escape of a colloidal fluid from the cut end of the axon. The same occurs when a condition of peripheral neuritis exists; also in transverse lesions of the spinal cord; and for the same reason—namely, trauma of the axon—there is a similar change in the Betz cells of the cortex, in the cells of Clarke's column, in the red nucleus, and in Deiter's nucleus.

In fixed and stained tissues a perinuclear chromatolysis is observed; the liquid which penetrates into the cell produces a tumefaction of the cytoplasm, and subsequently partial or complete dissolution of the Nissl granules. The variations in the swelling are dependent upon the severity of the injury. Thus, in a case of a fracture dislocation in the lower cervical region of mine, Sewell and Turnbull found the Betz cells of the cortex in the leg area showed a more pronounced change with subsequent atrophy than the cells of the arm area; this I explained by the fact that a larger length of axon was cut off, also many more collaterals of the neurones of the leg area, than in the case of the neurones of the arm area.

Experimental Anaemia.

The same disturbance of the normal osmotic pressure occurs in respect to the cells of the brain and the circumambient medium after experimental ligation of all four arteries. The cortex of the brain is for a time deprived of blood; cerebro-spinal fluid accumulates in the perivascular spaces and fills up the vacancy caused by the cessation of the arterial circulation in the cranial cavity. The cerebro-spinal fluid normally is isotonic to the nerve cells, yet there must be a marked disturbance of the normal osmotic pressure, for all the cells swell more or less, not only the body of the cell but the nucleus also. Here is a photomicrograph of the cortex of a dog with both vertebrals and both carotids tied; for a few days the animal was demented and did not see or hear or feel; but it soon recovered its senses, and when killed ten days later it would have been difficult to have detected anything wrong with the animal. The cells are seen to be swollen, the nucleus is larger and clearer than normal, but although all the cells show this change to some degree, in none is the nucleus extruded. Here is a photomicrograph of a cat's brain, showing the cells after ligation of all four arteries. One is struck by the enormous size of the nucleus caused by nuclear endosmosis. By the side of many cells with this marked condition of nuclear swelling is a cell which appears hardly at all swollen. This can only be explained by a difference of the specific energy in cells.

The swelling of the cell observed in these conditions of anaemia, as in trauma, leads often to dislocation of the nucleus; it no longer occupies the centre of the cell body but becomes eccentric, and so great may be the swelling that the nucleus is expelled. Many of these experimental anaemia cells exhibit appearances indicative of a distinct cell membrane. Monkeys usually died in convulsions after ligature of four arteries, restoration of collateral circulation not taking place in the rapid manner that it occurs in dogs. Here is a photomicrograph of a large pyramidal cell of a monkey so experimented upon. The outline of a membrane can be seen; the nucleus appears to have been extruded. Here, again, is a large Betz cell of a dog in which all four arteries were ligatured in which nuclear endosmosis is most pronounced; the swelling of the cell body is not so marked; in fact, in these cases of experimental anaemia the swelling is much more obvious in the nucleus than in the cytoplasm.

Lastly, I show the photomicrograph of a Betz cell of the cortex of a cat, in which all four arteries were tied by Dr. Hill. It was killed twenty-four hours after the operation; already it showed that a collateral circulation would soon have been established. This we discovered in the following way. The cat was lying apparently indifferent to everything around until a dog approached; the instinctive aversion of the cat to the dog aroused the biological stimulus of offence in its usual form of spitting and clawing. There is a little swelling of the cell on one side, but the most obvious change is the swollen nucleus, the nuclear membrane being distinctly seen; and all these preparations show that the nucleus possesses a highly resistive, elastic colloidal membrane. It will be noticed also that there are a number of argentophil granules in the nucleus. The wall of the nucleus is apparently indistinguishable from the fibril substance permeating the cell and its processes.

Why should an isotonic fluid pass into the cell and its nucleus in this complete but temporary anaemia? What has happened? An absence of oxygen is the main event; the vital energy of the whole cell, and especially that part of it which initiates nutrition and very probably function also, is depressed, resulting in a disequilibrium of the normal osmotic tensions of the cell structures and the circumambient medium.

Effect of Trauma on the Neurone.

In cases of trauma of the axon causing swelling of the cell and perinuclear chromatolysis we do not see such a disproportionate swelling of the nucleus, although fluid penetrates the cell membrane. It is conceivable, therefore, that the nuclear material possesses an essential chemical substance of the nature of a ferment for the utilization of oxygen, and possibly thereby storage of neural energy substance.

Having thus considered briefly what happens to the nerve cell as the result of injury, we may inquire, How does it recover, and what will determine its recovery? The more severe the injury—for example, tearing out a nerve—the greater will be the consecutive atrophy and disappearance of nerve cells; in fact, this constituted the von Gudden method, applied later by von Monakow and others for determining the nuclear origin of the cranial nerves by comparative observation of the cells of the nuclei of the two sides in the stem of the brain after evulsion of a nerve of one side.

When the swelling of a cell has arrived at its maximum,

it is followed by an inverse phenomenon involving the passage of water from the interior to the exterior, which explains the return of the cell to the normal; it may not, however, return to the normal but undergo atrophy. Endosmosis causes, according to my observation on the living cell, a swelling of the homogeneous viscous spongioplasm and disaggregation but not dissolution of the granules of the cells. Marinesco observed, after section of the sciatic nerve in newborn animals, the number of diaphanous cells increase, and he attributes this to a disaggregation of the colloidal granules, presumably due to endosmosis. When the cells are stained by the silver method, as seen in the large Betz cell of the cat with experimental anaemia, the fibrils look granular and disintegrated. Moreover, numerous experiments by Cajal, Tello, and Marinesco show that the appearance of the fibrillary texture of the cell can be modified by physical and chemical modifications of the circumambient medium. In proportion as the water penetrates the membrane of the cell and as the current of endosmosis increases, the perinuclear elements are dissolved or pushed away to the periphery, the mechanical pressure within the cell increases and pushes the nucleus, now unsupported by those forces which tend for equilibrium, in the line of least resistance. When these forces have arrived at a maximum it would drive the nucleus out of the cell if it were not for the resistance offered by the cell membrane. The nucleus, indeed, may be driven out, but owing to the greater resistance of its wall it remains intact.

We do not know what is the reason of the appearance of the fibrils; the fact that they change in thickness and under certain circumstances break up into granules may mean that colloidal granules are the living antecedents of these dead fibrils. In amaurotic idiocy we often have an appearance as if there were a destruction of the whole of the fibril substance, except the extreme periphery of the cell—that which would constitute the cell membrane; this pericellular fibril appears to be continuous with fibrils of the axon and the dendrons, the whole of the intracellular network of fibrils having disappeared; but the periphery of the cell constitutes the osmotic membrane. In some instances the axon and dendrons as well as the cell are enormously swollen, but the periphery of them is stained with the silver. I have thought it possible, therefore, that the same colloidal substance which forms the membrane of the cell is continued on to the processes.

Effect of Hyperthermia on the Neurone.

Hyperthermia produces a chemical change of the cell which may be regarded as a death process. I have subjected living posterior spinal ganglion cells in serums to a temperature of 116° for two to three hours; watching the changes under the microscope, the granules appeared to me to gradually disappear. I have not yet had time to observe the changes with the ultra-microscope, so I cannot say much about this at present. After submitting the cells to this temperature, I stained them with polychrome blue; the appearances they presented were very similar to the appearances cells present when hyperpyrexia occurs in the living body—namely, they stain a diffuse dull purple without any differentiation into chromatic and achromatic substance; a chemical change has occurred.

Halliburton and I found that this could be associated with precipitation of a globulin, and therefore a colloidal change in the cell results. Moreover, if each of the colloidal granules has a surface tension of its own, the heat would tend to expansion, increase of the surface tension, and rupture of the membrane. In a case of status epilepticus associated with high temperature which I examined, there was a marked swelling of the cell, an oedema with dislocation of the nucleus, diffuse dull staining, and absence of differentiation of chromatophil elements, and around the cell could be seen the distended perineuronal space. The condition of status not only changed the bio-chemical and bio-physical condition of the cell by reason of the high temperature, but there were two other factors at work—namely, an insufficiency of oxygen and an excess of CO_2 in the circumambient medium. As a result there was enormous swelling, diffuse staining of the Betz cells, but although the nucleus was eccentric, it was not markedly swollen, as in the case of experimental anaemia.

All the facts seem, then, to show that in the normal living cell there are two colloidal substances—one, fluid granules with a delicate membrane, the other, a viscid homogeneous semi-fluid colloid forming a spongioplasm. Under certain conditions—for example, hyperthermia—the fluid granules are destroyed and blend with the spongioplasm.

Changes in Nerve Fibres.

Having thus considered the changes which occur in the cell, I will now pass on to the changes which occur in the cut nerve, and I will illustrate my remarks first by some photomicrographs of microscopic specimens, prepared by the Cajal silver method, kindly lent to me by Professor Marinesco. The first shows the appearances presented by the central stump of the sciatic nerve of a young dog fifteen days after resection of 20 cm. of the nerve. You will observe the neoformative reaction in the form of new regenerating fibrils; numbers of these are, however, coiled up in spirals. Another preparation illustrates the results of section of the sciatic nerve of a kitten, the animal being killed one month after the operation; the neoformative reaction of repair is well seen, for active regeneration has occurred by the outgrowth of the neuro-fibrils across the seat of the lesion; these fibrils in great numbers have penetrated the peripheral stump of the nerve, and active regeneration is occurring.

Now, it was first shown by Peroncito that a neoformative reaction occurs within six to forty-eight hours of section. It must therefore be assumed that active bio-chemical and bio-physical processes take place very soon if not immediately after the injury. But still more interesting and important are the observations of Peroncito, Cajal, and Marinesco, regarding the neoformative reaction in the peripheral stump of a cut nerve, and even in portions of nerve separated from both the peripheral and central ends, by two sections, so that it is isolated. Peroncito was the first to demonstrate that non-medullated fibres of a cut nerve are more resistant to degenerative processes than myelinated fibres. Cajal confirmed this, and found that non-medullated fibres are hardly altered at the third or fourth day after section. When a nerve is cut simultaneously at two points both ends show a neoformative reaction; but the reaction attains its maximum at the upper extremity of the peripheral end. In the intermediary fragment the reaction is limited almost exclusively to the non-medullated fibres, without, however, the power to attain the same degree of development as in the peripheral end of the isolated piece of nerve. The farther apart the two sections of nerve, the more numerous and extensive are the metamorphoses of the non-medullated fibres. The reaction is the more intense the farther the section is from the termination of the nerve. The nerve fibres which are separated from the trophic centre, and which in consequence undergo degeneration, can react as the result of a new section farther removed from the first, up to a certain interval of time; this secondary reaction Marinesco says can occur up to five days. But this new reaction is much less pronounced than the first section. The myelinated fibres which yield the most marked reaction, and in consequence possess the greatest resistance to destruction, appear to be the sensory fibres, which explains, at least partially, the difference of reaction that may be found between bundles of a mixed nerve. Marinesco says we ought to consider these metamorphoses as an attempt on the part of the protoplasm separated from its trophic centre to adapt its extremity to an equivalent function.

The injury leads to endosmosis; water enters the axon, swells up the colloidal substance, as it does in the cell, and it might be conceived that this, as in the case of the cell, squeezes out colloidal fluid.

Cajal has postulated the existence of ultramicroscopic particles, neurobions, or physiological living units, which are reciprocally attracted to form fibril systems of a variable morphological character and extension. This ingenious hypothesis may possibly serve to explain the various phenomena which I have described as occurring in cut nerves and in isolated portions of nerves.

All the facts which I have described show the probable great importance of such bio-physical processes as surface tension, osmotic pressure, and movement of ions in the explanation of the vital functions of the neurone. Under normal conditions the surface tension of the cell is greater

than that of the axon. MacCallum has shown this by proving that there is a great condensation of potash salts around the cells, whereas potash is relatively less around the axon and penetrates the nerve fibre; this, according to the Gibbs-Thomson law, shows that the surface tension of the cell is higher than that of the axon. The more viscid colloid may consist of the hypothetical ultramicroscopic neurobions; in the cell, and extending into the dendrons, is a colloidal fluid consisting of spherules, each with a delicate membrane, which converts this viscid, more solid, colloidal substance into a spongy network.

Stimuli arriving from the periphery, or by way of other neurones, are conveyed by the dendrites and dendrons to the cell, where physical and chemical changes may be set up which lead to an increase of the surface tension of the cell, causing dynamic changes in the colloidal constituents of the axon, resulting in an amoeboidism of the terminals forming the synapse with another neurone. The experiments of Ross Harrison already referred to place this hypothesis within the range of possibility.

Again, as pointed out by MacCallum, surface tension of the neuroblast may explain the outgrowth of the processes to form axon and dendrons, but in this case, as in the case of regeneration, an attractive force operates—namely, chimio-tropism, or the mutual attraction of biologically related tissue structures. Now, in regeneration of nerves after section, undoubtedly the neurilemmal cells play a considerable part in regeneration by exercising a bio-chemical tropism on the colloidal substances in the cut end of the central stump of the nerve. Indeed, there are two forces at work—namely, this bio-chemical tropism and the dynamic force of surface tension of the ganglion cell, which has been increased by endosmosis, and both forces are operating continually upon the colloidal substances of the axon. If we accept the neurobion hypothesis of Cajal we may consider that the ultramicroscopic neurobions escape from the cut end of the nerve and are attracted to one another, so that stained by the silver method they look like fibrils. Those that cross the cicatrix are, as it were, pulled in a continuous stream by a chimio-tropism exercised by the sheath cells. Moreover, if we regard the neurobions as formed by a semi-fluid colloid, then we can understand how regeneration of a long stretch of nerve—for example, the sciatic—can take place within a comparatively short space of time.

Again, we have seen that the silver preparations show terminal balls and spirals; the former seem to indicate coagulation and death of the neurobions; the latter an absence of chimio-tropic influence. They were both especially numerous and extensive in the specimens where 2 cm. of nerve had been resected, whereas in the specimens where only section had been performed there were hardly any visible.

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THE THEORY OF NERVE EXCITATION.

IN this communication it is proposed to consider only the physico-chemical conditions under which excitation of the neurone occurs, by excitation being meant that alteration induced in some portion of the neurone (for example, in the axis cylinder process) which is necessary to set up a propagated disturbance. We are not here dealing with the nature of the propagated disturbance, though the study of the physico-chemical conditions under which excitation occurs will no doubt ultimately lead to a theory of the nature of the propagated disturbance.

Towards the close of last century a number of empirical data, for the most part investigated quantitatively, had already been accumulated, especially in regard to the duration and liminal strength of current, which when applied to a motor nerve is capable of exciting a muscular contraction. These data must necessarily form the foundation of the physico-chemical theory of excitation.

The first step in the development of a theory of excitation was taken, not by a physiologist, but by a physical chemist. In 1899, Nernst[1] advanced a hypothesis of the nature of the change produced in an excitable living cell by the passage of an electric current. Regarding an organized tissue as a conductor of purely electrolytic nature, Nernst recognized that the only effect of a galvanic current would be to cause ionic movement. In a living cell in which some of the colloids present constitute a semi-permeable membrane, such ionic movement must result in changes of ionic concentration at the surface of such semi-permeable membrane, and this change would again in turn be opposed to a greater or lesser extent by diffusion. Nernst advanced the hypothesis that the necessary condition for the occurrence of excitation was that the concentration at the membrane should reach a definite value. He did not, however, remain content with putting forward a hypothesis which furnished a plausible quantitative explanation of excitation, but proceeded to take steps to attempt to verify this hypothesis, and thus to bring it within the domain of established fact, by showing that it was quantitatively in accord with the ascertained phenomena of nerve excitation. Nernst calculated the varying conditions of strength and duration of current at the membrane which are just sufficient to produce a given ionic concentration, and obtained integral formulae which may be simplified, when dealing with the minimum conditions of current necessary to cause excitation, to

$$\frac{i}{\sqrt{m}} = \text{const.}$$

when alternating currents are employed, and

$$i\sqrt{t} = \text{const.}$$

when ordinary currents of short duration are employed; i representing the strength of current, m the number of alternations per second, and t the duration of the current.

Nernst's hypothesis of the nature of excitation was found to be in accord with the results of experiments made by v. Kries,[2] Zeynek,[3] Nernst and Barratt,[4] and Reiss,[5] using alternating current, and by Weiss[6] and Lapicque,[7] employing a constant current of short duration, the latter also working with condenser discharges.

It was, however, observed with agreement that the formulae could in each case be obtained only when the conditions of experiment did not exceed certain limits. For stimuli the duration of which exceeded a relatively low limit a lack of complete agreement was observed.

The value of a hypothesis, however, depends upon its capacity to cover all the phenomena which it is intended to explain. Only when the agreement of theory with experience is complete can the explanation offered rank as an ascertained fact. It became necessary, therefore, to examine further the phenomena which did not appear to be in accord with Nernst's hypothesis.

During the period covered by the above investigations Lapicque[8] and Keith Lucas[9] had independently shown that the current required to excite any tissue becomes smaller as the duration of its passage becomes longer, but only up to a certain duration; for all longer durations the strength of current required for excitation is the same. Further, it was shown by these observers that gradually

increasing currents failed to excite if increasing with less than a certain minimum rapidity. These phenomena lay outside the formulae of Nernst. Keith Lucas[10] suggested that the original hypothesis of Nernst should be supplemented by the additional hypothesis that the required ionic concentration must be reached within a certain period of time; he was, however, unable to decide which of the two possible causes determined the need for this rapidity of concentration—whether, on the one hand, the requisite concentration would never be reached if not reached rapidly, or whether, on the other hand, it might in point of fact be reached slowly, but would then fail to initiate the propagated disturbance. Lapicque[11] adopted the former alternative.

A more extended mathematical investigation of Nernst's theory was next made by A. V. Hill,[12] who adopted Nernst's original hypothesis, but developed the reasoning afresh, introducing into his formulae a constant representing the distance by which the colloidal membranes, assumed to be present in the excitable material, are regarded as being separated. His equation in its simplest form is:

$$i = \frac{\lambda}{1 - \mu\theta^t}$$

in which i and t have the same significance as before, and λ μ and θ are constants dependent upon the conditions of experiment. Using this formula, Hill showed that the original hypothesis of Nernst gives a complete quantitative account of the phenomena of excitation by constant currents of variable duration. Turning now to consider the inefficacy of slowly increasing currents, Hill shows that assuming the requisite concentration to be actually reached, nevertheless it would fail, owing to its slow increase, to set a propagated disturbance in motion if the propagated disturbance were dependent upon a certain rate of breakdown of a compound contained within the excitable cell.

Keith Lucas,[13] applying Hill's formula to the results of experiments, showed that Nernst's original hypothesis would explain the paradoxical effect of temperature of nerve first observed by Gotch and Macdonald[14]—namely, that a nerve when cooled becomes more excitable to currents of long duration and less excitable to currents of short duration. Keith Lucas also studied the effect of changes in the conditions of experiment in modifying the values of the constants of Hill's formula.

In all the cases so far considered the value of Nernst's hypothesis has been tested by the aid of quantitative methods. The hypothesis, however, is capable of furnishing a qualitative explanation of many phenomena in respect of which no investigation of its sufficiency by quantitative methods has as yet been attempted. As an illustration may be taken the "apparent inhibition" first observed by Wedensky,[15] and subsequently the subject of much research, especially by Hofmann,[16] Fröhlich,[17] and Keith Lucas.[18] The Wedensky effect in its simplest form depends upon the circumstance that a stimulus applied to a nerve immediately after its refractory period has passed off may produce a subnormal disturbance, which, though successfully conducted along the nerve, fails in conduction between nerve and muscle, and may yet so modify a subsequent stimulus as applied to the nerve that it does not provoke a response in the muscle. The subnormal impulse in the nerve fails to excite the junction between nerve and muscle. In this case, again, Nernst's hypothesis suggests a possible explanation of the lack of conduction, but, as already mentioned, the applicability of the hypothesis has not yet been tested by quantitative methods.

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DISCUSSION.

Dr. H. M. VERNON (Oxford) said: The hypothesis of Dr. Mott that Nissl granules and neurofibrils cannot be considered to exist in living cells because they are not to be observed in such cells when microscopically examined in the living condition, can hardly be accepted without question, for it must be remembered that if the index of refraction of a substance be the same as that of the fluid in which it is bathed it would be microscopically invisible. Protoplasm frequently appears homogeneous when examined microscopically, yet we know that it is not so, but consists of an emulsion, a spongework, or foam-like structure of heterogeneous materials. Dr. Mott found that living nerve cells were unable to take up the isatin blue stain which Dr. Goldmann had shown to have such striking *intra vitam* staining properties. Dr. Goldmann however, found that this and other stains picked out and stained certain cells of the tissues, especially connective tissue cells, and left others untouched, and hence the positive evidence of Marinesco—according to whom the Nissl's granules of the cells are stained by neutral red—seems to me of more weight than the negative evidence adduced by Dr. Mott.

NOTE UPON SOME DYNAMIC PRINCIPLES INVOLVED IN PROGRESSION.

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WHEN analysed the act of progression along the surface of the ground or in the air is seen to consist of three main parts. In the first place there is the "start" from a stationary posture; in the second place there is the maintenance of the initial velocity—the progression itself; and in the third place there is the "stop." Of these three parts of the act, the first and third are physical necessities, for a stationary body cannot become a moving one without the transformation of energy—nor can a moving body become stationary. But under infinitely perfect conditions the second part of the act might be a purely passive one. That it is an active and integral portion of the phenomenon is conditioned by the presence of friction between the moving parts of the individual itself, by the presence of various external resistances to the moving animal, and by the inequalities of the surfaces over which the animal passes.

Were the environmental conditions perfect and the surface of the ground level, the moving animal—having once started—would continue to move with the same velocity until stopped by the conversion of more energy. It is useful to look upon the act of progression as one based upon this foundation, and the conversion of energy during its process as a compensation for the retardation of the act by external resistance.

It seems to me that the act of progression itself—whether it be by flight through the air or by such movements as running over the surface of the ground—consists essentially in a movement in which the centre of gravity of the body is allowed to fall forwards and downwards under the action of gravity, and in which the momentum thus gained is used in driving the centre of gravity again upwards and forwards; so that, from one point in the cycle to the corresponding point in the next, no work is done (theoretically), but the mass of the individual is, in effect, moved horizontally through the environment. The whole may be likened to the swing of a pendulum, and resembles the movement of a railway train along some railway lines. There each station is placed at the top of a slight hill. A train approaching a station has its speed reduced in ascending the hill. One leaving a station more rapidly attains its maximum velocity in running down the other side of the hill. So that the energy of momentum which is usually wasted at a station in the application of

brakes is here—in part at least—stored in a potential form (that of height) in order to be again used in the passage from that station to the next one. The train really swings from station to station like the ball of a pendulum. In a similar manner the centre of gravity swings like a pendulum in many forms of progression in the vertebrate, and this may be termed the simple harmonic movement in progression. Of course the pendulum-like swing of the limbs in progression is not referred to here.

This principle is seen in progression by flight through the air. A bird which glides through the air without perceptible movement of its wings slides down a long incline towards the surface of the earth, and then slides up another long incline away from that surface. During this process the velocity of the bird gradually increases from a minimum at the commencement of the glide to a maximum at its lowest point; and then again decreases to a minimum as it again reaches the summit of its ascent. As the bird is rarely absolutely stationary at the summit between two consecutive glides, each glide commences with an "initial velocity," and the speed of the flight of the gliding bird is composed of this initial velocity and the changing velocity conditioned by the force of gravity during the glide. The direction of the glide is conditioned by the set of the wings, and the speed of the whole swing from summit to summit is composed of the initial velocity, an acceleration and a retardation conditioned by the component of gravity along the angles of the downward and upward glides, and the retardation caused by the air resistance against the surface of the wings and body.

Just as a pendulum which is not swinging *in vacuo* from a frictionless fulcrum does not swing back to the point from which it started, so the bird in flight by gliding does not attain to the same height at the end of each glide. A part of the potential energy of its height at the beginning of a glide is used up against the wing resistance and in the "leeward slip" of the bird from the true line of its glide. A series of glides will therefore bring it ever nearer to the surface of the earth. As a counteraction to this there is a factor in the phenomenon of flight—that of the raising of the bird against gravity by the beating of its wings. There are thus, in all sustained flight, an "initial velocity" with which each glide (and the flight itself) is commenced, a changing velocity in the "simple harmonic movement" of the glide, and an "incremental velocity" which is given by the beating of the wings and replaces the potential energy of height neutralized by air resistance and the downward slipping of the animal.

Where the angle which the direction of the glide makes with the plane of the horizon is small the velocity of the glide will be also small—for the component of gravity in the direction of flight will then be slight—and at the same time the wind resistance (which varies in proportion with the square of the rate of progression) is relatively small. But where the direction of flight makes a large angle with the horizontal the velocity of the flight will be greater, and at the same time the factor of air resistance will be still more great. The speed of flight by gliding may be regarded as conditioned by the bird swinging either slowly as a long pendulum or rapidly as a short one. In the former case the speed will be small, but the actual energy expended will be also small; in the latter case both will be greater.

If this view be taken, the fastest flight—in which the wings are kept continually beating—may be looked upon as a very steep glide during which the lost potential energy is being continually replaced by means of the movements of the wings. It seems to me that the question here arises whether the rapidity of the bird's flight is altogether due to the rapidity of the movements of its wings; for it is possible that the rapidity of the movements of the wings may be due to the rapidity of its flight—that is, to the rapidity of its fall through the air. In this connexion one or two observations may be made.

In the first place, it is interesting to note that birds which habitually glide—such as sea birds—often give a beat or two of their wings at the bottom of a glide, and that if they commence to progress by rapid flight (continuous movements of the wings) they do so often at the level of the bottom of a glide. Another observation may be made with a normal pigeon. If it be held in the hand from behind in such a manner that the wings are free, and if (being held in the hand all the time) it be dropped slowly towards the ground, there may be little or no movement of the wings. But if it be dropped more rapidly, the wings may perform a single beat; while if very rapidly dropped they may perform several beats. This phenomenon occurs also when the head of the pigeon is covered in such a manner that the bird cannot see.

It may be that the movements of the wings are, in part at least, reflex and from the labyrinth. As is well known, the semicircular canals are exceptionally well developed in all flying birds, and this exceptional development may be not only the basis of their necessary nicety of balance, but also that of the regulation of their flight. These organs are essentially for stimulation by acceleration and retardation of the velocity of the head, and it is by no means unlikely that in the downward glide of a bird the stimulus of acceleration so rises as to produce the reflex response of wing movements. This reflex will set a limit to the velocity attainable by the bird, besides at the same time automatically compensating for the lost potential energy absorbed by the wing resistance and the downward slipping.

The act of progression in the walking mammal—for simplicity we may consider the case of man—on analysis closely parallels the act of flight in the bird. At each step the centre of gravity may be regarded as performing a downward and an upward glide. In the gliding bird the angle of the glide is conditioned by the angle of tilt of the wings. In the walking man the angle of glide is conditioned by the length of the limbs, which act by their upward thrusts the part of the air resistance upon the under surface of the bird's wings.

The cycle of progression may be supposed to commence at a point at which one of the limbs is perpendicular to the ground. The "initial velocity" then carries the body past this point, and it then falls forwards along the circumference of a circle the radius of which is the limb in contact with the ground. At the same time the other limb is being swung forwards more rapidly than the centre of gravity, and it also comes into contact with the ground at that point at which the centre of gravity most nearly approaches it. For an instant the body rests upon a compound pendulum composed of the two limbs, and then it begins to ascend along the circumference of a circle the radius of which is the second limb. At the point at which this limb becomes perpendicular the centre of gravity again passes downwards and forwards; the first limb again comes into contact with the ground; the centre of gravity again passes upwards and forwards when the first limb is resting upon the ground; and when that limb is again perpendicular the cycle repeats.

Were the conditions of this act of progression perfect and the surface of the ground perfectly level, each of these "glides" would leave the centre of gravity of the body at the same distance from the ground. The "initial velocity" of the progression would then be handed on unimpaired from step to step. In each downward "glide" there would be an acceleration of this velocity, and in each upward glide there would be a retardation. But with a given length of limb there would be little elasticity in the average velocity of progression with a given "initial velocity"—for there is scope for little variation in the length of a given limb, and thus there is little possibility of changing the velocity by changing the swing of the pendulum.

But the conditions are not perfect. In the first place, the surface of the ground is rarely perfectly level. There is an air resistance which tends to retard the velocity of progression. There is friction at the moving joints of the limbs and at the skin over these joints. And there is a certain amount of backward slip between the foot and the ground with which it is in contact. All these factors tend to retard the velocity of progression, and, were it not replaced, the initial velocity would soon be used up in bringing the centre of gravity of the body past the perpendicular at the top of succeeding glides.

To compensate for this wastage, an "incremental velocity" must be added during the act of progression. This in part may be given by a direct upward thrust of the hind limbs during walking. Thus, by bending of the knees, the length of the lower limbs may be progressively shortened during progression, so that the centre of gravity

comes ever nearer to the ground. In such a case the initial velocity might be conserved at the expense of the potential energy of the height of the centre of gravity of the body from the ground. This potential energy may be replaced by a slight active extension of each lower limb during the ascending part of each "glide." In other cases there may be given an increment to the "initial velocity" by an active backward thrust of the lower limbs against the ground at the end of each downward "glide."

In very slow walking—where the air resistance, backward slip, etc., are slight—the incremental velocity is not great. But in running, the active forward and upward thrust is a great factor in the progression. This factor not only compensates the imperfection of this method of progression, but gives it an elasticity of velocity which it would otherwise lack. It may be remarked here that, just as in the case of the running man the incremental velocity is given by an active movement which thrusts the body forwards as well as upwards, so, too, in the case of the flying bird the beats of the wings may propel it forwards in part as well as upwards.

THE SUBSTANCE FROM YEAST AND CERTAIN FOODSTUFFS WHICH PREVENTS POLYNEURITIS (BERI-BERI).

By CASIMIR FUNK.

From the Bio-Chemical Department, Lister Institute of Preventive Medicine.

IT has recently been shown[1] that a substance preventing polyneuritis may be isolated from rice-polishings, and the name *vitamine* suggested for it.[2] This substance has the provisional formula $C_{17}H_{20}N_2O_7$, and crystallizes in colourless needles which melt at 233°. The small yield obtained did not, however, allow of many curing experiments being performed, and as the substance was not recrystallized doubts about its purity might be entertained. A confirmation of these facts was therefore absolutely necessary, and in the first instance yeast which is known to be curative was chosen as the source of the material, since it promised to give a better yield than rice-polishings. It was of great interest to see whether yeast contained the same substance as rice-polishings or only an analogous compound. The yield obtained did not, however, come up to expectation. Although very few grams of pressed yeast are sufficient to cure a pigeon suffering from polyneuritis and, as Eykman recently showed,[3] the curative substance can be extracted by means of alcohol, the yield was even smaller than in the case of rice-polishings. Before Eykman's paper appeared, the author tried to extract yeast with alcohol, but only a small part of the active substance could thus be removed. The bulk of the substance remained in the yeast, even when the latter was boiled with alcohol for several hours. This suggests that the substance is to a great extent present in the yeast in a combined state. Schaumann,[4] in a recent publication, has confirmed the results previously published by the author, but thinks that besides the curative substance another substance is required. He founds this opinion upon the ground that the yield of the curative substance obtained from yeast or rice-polishings compared with the quantity of original yeast or polishings necessary for cure is so exceedingly small. As just stated, however, the extraction is far from being complete, and during the fractionation the yield of vitamine became smaller and smaller.

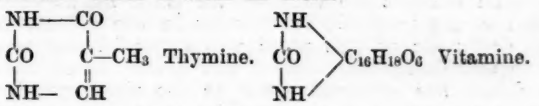
The yeast was worked up by the two following different methods. In the first case the alcoholic extract was simply evaporated, and the residue hydrolyzed with sulphuric acid, the solution being then treated as in the case of rice-polishings.[1] By precipitating first with phosphotungstic acid and then with silver nitrate and baryta half a gram of the curative substance was obtained.

In the second case the alcoholic extract of yeast after evaporation was extracted with water. On precipitation with silver nitrate and baryta, however, only an unappreciable quantity of the curative substance could be detected. The filtrate from the silver precipitate contained the bulk of it, and it was necessary to hydrolyze this with acid before the precipitation could be effected. The resulting fraction unfortunately contained all the pyrimidine bases which are known to be constituents of yeast nucleic acid, and of these uracil and thymine could be isolated in a pure state. From this mixture it was found that the reagents ordinarily employed for the separation of the curative substance also precipitated more or less of the pyrimidine bases. After a long and troublesome fractionation, however, a small quantity of pure curative substance was obtained which showed the characteristic properties.

A large number of cures was effected on pigeons, and there can be no doubt that this substance is the sole curative agent, the dose used being 2 to 4 cg.

In the first place, it is necessary to correct the previous statement that the curative substance was isolated in form of a nitrate. This is not the case, the substance which was analysed having been found to be the free base. The curative substance must be regarded as a base, probably belonging to the pyrimidine group. The aqueous solution is of neutral reaction and does not react with acids. By boiling with copper oxide no copper salt is formed, and therefore it is not an amino-acid. Recrystallized from dilute alcohol, the substance melts at 233°, at the same temperature as the curative substance from rice. It gives the same reactions, and both substances must therefore be considered as identical. It is precipitated in a pure state by mercuric acetate as well as by silver nitrate, but not by mercuric sulphate or nitrate.

All these properties suggest that vitamine is a pyrimidine base, analogous to uracil and thymine, and that it probably is a constituent of nucleic acid. On this view the two nitrogens would be combined as in other pyrimidine bases to form an ureid.



Only a constitution of this kind would explain the neutral reaction of the substance and the great analogy to the other pyrimidine bases.

The curative substance was also isolated by analogous methods from milk (this fact being very important for our knowledge of infantile scurvy) and brain.[5] Everything suggests that in all these cases the substance is identically the same. Further, a substance curing avian polyneuritis was found in lime juice, and is at present being more closely investigated.

By extraction of rice-polishings with alcohol without the use of phosphotungstic acid, allantoin could be isolated. This substance, which shows a great similarity in properties, is, however, entirely different from the curative substance. Physiologically it possesses a very marked action when given to birds suffering from polyneuritis. It prolongs the life of the birds without, however, improving the neuritic symptoms.

These experiments throw an entirely new light on the physiological importance of the nucleic substances.

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DISCUSSION.

Professor H. M. VERNON (Oxford) said: Recent experiments on the physiology of nutrition point to the great importance of lipoids in diet. Stepp fed mice on milk bread, and found it adequate to maintain their vitality and health. If this bread was extracted with alcohol and ether, mice fed upon it rapidly lost ground and died in twenty-three days on an average; but mice fed on extracted bread to which the alcohol-ether extract had been added, remained in health. Bread extracted with alcohol, ether and chloroform killed off the mice like alcohol-ether extracted bread, but unexpectedly it was found that the addition of the alcohol-ether-chloroform extract to extracted bread did not confer any additional nutritive qualities on it. Hence it seemed probable that the chloroform extraction had destroyed some complex lipoid substance of the tissues which alcohol-ether extraction

had not affected. Addition of pure lecithin or cholesterin to pure synthetic diets does not give them a life-supporting value, so it is evident that some complex combined compound is required.

Dr. HEWETSON (Rhodesia) said: As a practitioner from the tropics having to deal with scurvy, I have followed closely recent progressive discoveries in regard to beri-beri, in the hope of light being thrown on scurvy. I have come to this purely scientific Section in order to pursue that line, and have been greatly enlightened on many points by what I have heard. I had not heard till to-day that the actual base, the deficiency of which causes beri-beri, had been isolated, and I congratulate Dr. Funk on his success. I shall be glad to hear from him when he has isolated from lime juice the corresponding base which is alleged by him to be the effective agent in preventing scurvy; and I also hope that he may find it in sufficient quantity to allow me to give it a practical trial. It may not be generally known that scurvy is, or at any rate has been, one of the most important diseases from which South African native labourers suffer. The place where I am located may be regarded as an endemic site. There was what merited the name of an epidemic existing about the time I began work in the place. Having realized in practice in England the value of fresh unboiled milk, etc., in scurvy-rickets, and the general situation on these matters, it was natural that I should take similar views in this case. After a time, however, I came to the conclusion that there was a confusion of a virulent gingivitis, which the natives are prone to, caused by the fermentation of carbohydrates on the teeth, and which was capable of going on to such effects as to cause death. The nature of the gum changes are those of an acute inflammation, and are not preceded by changes in the alveoli, etc. The diet scale at this place was improved also when this epidemic occurred, but I put down the fact that no death has occurred since to the rigid system of oral hygiene which I introduced on concluding that the mouth affection was an inflammation. What I have heard to-day has confirmed me in what I was suspecting—namely, that what we have in South Africa is a different type of thing. (1) One recent case of mine had a temperature of 103° F., and to all appearance beautifully clean gums and no discoverable septic focus (a distinct temperature is of very frequent occurrence indeed). Owing to the strict oral hygiene, and having all the natives' mouths in good order, I have been able to appreciate that a rise in temperature can take place apart from any septic focus, though this of course always greatly increases its degree. (2) It is not immediately curable by fresh food—that is to say, the remarkable and absolute changes seen in experimentally produced scurvy, in scurvy-rickets, etc., do not occur. I recently saw a case in a splendidly appointed hospital in Johannesburg which had been having first-class food, and had been there for six weeks. He was running a temperature, and was by no means convalescent—in fact, was confined to bed, and in quite a bad way. (3) Lime juice is discredited probably by 80 per cent. at least of mine medical men. The suggestion that there may be a poison, producing a neuritis of the sensory nerves, present in small amount in the food—maize is the staple—is one that I am inclined to give adherence to, although I would not like to say that our disease has not a bacterial factor which enters early during the induced debility. At my place, in spite of oral hygiene and a dietary which could not fairly be called in question, I have had, during the past hot season—hotter than the previous one, when I had practically no trouble—many cases of a slight degree. Four or five daily would frequently present themselves (out of 600) complaining of pain in the calf or lower third of the leg, with in some cases a slight amount of firm swelling there. That is the commonest type. A week or a fortnight off work with general medical attention was sufficient to enable these to return to work, but some cases were much more persistent and lasted right into the cool season. Though pellagra occurs amongst most maize-eating peoples, it is quite rare in South Africa, and I have not seen an undoubted case (in Rhodesia). We must remember that many of our most potent pharmaceutical products are derived from vegetable products and that in tropical countries the soya bean is an important commercial article and yields a certain quantity of prussic acid. In dry seasons it is alleged to produce more than usual, and farmers tell me that it is sometimes fatal to cattle and domestic animals under these circumstances. It may be that the substances which prevent and remove beri-beri, etc., act by neutralizing some other poison found in minute quantity, and such a circumstance would give almost identical experimental results. And there is the important fact to remember that experimental animals which are starved live longer than those fed on polished rice.

DISCUSSION ON TISSUE RESPIRATION.

OPENING PAPERS.

I.—H. E. ROAF, M.D.,

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RESPIRATION has to deal with the absorption of oxygen and excretion of carbon dioxide. As the links between these two processes involve the chemical changes by which oxygen combines with materials in the cells, giving rise to carbon dioxide and other substances, a consideration of many points in general metabolism is necessary.

Isolated cells can maintain their gaseous exchanges with their surroundings by means of diffusion, but multicellular organisms require some mechanism by means of which the gases can be transported to and from the cells. This mechanism is the subject studied under the heading of external respiration. Tissue respiration deals with the oxidative processes that occur in the cells. It is interesting to note, however, that the problems of tissue respiration also enter into the subject of external respiration—for instance, the regulation of respiration by the respiratory centre depends on the gases in the blood, and hence on the gaseous metabolism of the cells in the centre.

The aim of respiration is to furnish free or available energy for the purposes of cellular activity. It is usual to measure the heat produced as an indication of the total energy exchange, but the available energy does not necessarily correspond to the heat produced.

The amount of heat produced, corresponding to a definite absorption of oxygen or output of carbon dioxide, varies according to the nature of the substance oxidized.

TABLE I.—*Approximate Figures for Oxidation in Vivo.*

	Carbohydrate.	Fat.	Protein.
1 g. oxidized gives K (large calories)	4.1	9.1	4.1
1 g. oxidized requires O_2 in g.	1.06	1.77	1.52
K for 1 g. O_2	3.87	5.14	2.70
Respiratory quotient	1.0	0.7	0.8

From these figures it is evident that the gaseous exchange cannot give the heat production unless we know the nature of the substance oxidized. The nature of the substance oxidized remaining the same, the gaseous exchange shows the relative amount of heat produced. If the respiratory quotient alters, the average composition of the materials oxidized is changing.

For most tissues it has been shown that increase of activity is accompanied by an increased oxygen intake and carbon dioxide output.[1] Not only does the carbon dioxide output lag behind the oxygen intake, but in some cases the oxygen intake[2] and heat production[3] follow the active process. Several writers have suggested that the gaseous metabolism is necessary after activity to restore the tissue to its former condition[4]; the activity is due to the sudden release of potential energy stored as the result of previous oxidation.

Certain instances of activity are not accompanied by increased gaseous exchange. Kidney filtration[5] shows no increased oxygen intake, whilst secretion by the tubule does increase the consumption of oxygen. This difference is quite easy to understand as the filtration in the result of the activity of the heart.

The rigidity of the muscles of the decerebrate cat differs from tetanus in that the former is not accompanied by increased gaseous exchange.[6] This distinction has been

made by measuring the oxygen intake and carbon dioxide output with the muscles rigid, and then after the rigidity has been abolished by curare or by cutting the nerves to the limbs.

It is not necessary to assume that the shortening of muscle in these two cases is different, but the explanation may be that in one case relaxation follows, whilst in the other the contraction remains. As mentioned before, the gaseous exchange follows the activity, and may be the preparation for fresh activity. Whatever the mechanism of contraction, the two processes may be compared to a pump maintaining a constant head of pressure; if there is a leak the pump must continuously supply fresh energy, but if there is no (or very slight) leak no (or very little) fresh energy is required. This analogy indicates the possible explanation of the difference between maintained contraction and tetanus.

Turning to the relation between the amount of oxygen consumed and the oxygen tension, it is necessary to consider the law of mass action. The rate of oxidation will depend on the pressure of oxygen and the concentration of the substance to be oxidized.

$$dx/dt = k\, C^{n}_{O_2}\, C^{m}_{\text{substance to be oxidized}}. \quad (1)$$

The accumulation of the products of oxidation will tend to inhibit a reversible reaction, as shown by the equation for equilibrium. The water formed can be omitted, as it is always present in excess.

$$\frac{C^{n}_{O_2} \times C^{m}_{\text{substance to be oxidized}}}{C^{x}_{CO_2}} = K. \quad (2)$$

If the change proceeds by a series of steps the equation would be less simple, but the net result would be the same.

Under ordinary conditions the oxygen pressure remains constant as the blood is saturated with oxygen at one-fifth atmospheric pressure. Acid products of metabolism may slightly increase the pressure and thus render the oxygen more easily available, but the cause of activity cannot be due to this increase in pressure. As the tissues use oxygen the partial pressure is maintained by an increased flow of blood. Therefore, as the oxygen remains fairly constant increased rate of change may occur in three ways. First, the amount of substance to be oxidized can be increased; secondly, carbon dioxide can be removed; and thirdly, if the reaction is not in equilibrium, increase of k in equation (1) would accelerate the oxidation.

The third of these possibilities will be considered by Dr. Vernon in a paper on enzymes which he is reading to-day. The second is the basis of a hypothesis by Lillie,[7] in which muscular contraction is considered as the result of an increase in cell permeability whereby carbon dioxide escapes and chemical reaction results. As mentioned above, the oxidation appears to follow the activity, and hence any increased permeability must follow the activity and not cause it.

In favour of the first suggestion is the fact that activity produces certain substances (for example, lactic acid) which may be the substances oxidized.

In many experiments the gaseous exchange has been measured by blood-gas analysis. These analyses do not entirely represent the oxidation in the tissues because of the time required for the gases to diffuse between the tissues and the blood. The time difference must be very slight, and hence the error may be negligible.

The oxygen intake presents an interesting problem. It is not likely that the oxygen tension in the blood can be altered by a nervous impulse, but there might be a secretion of oxygen by the endothelium of the blood vessels. Apart from such a secretion, the oxygen intake must depend on diffusion, and this is proportional to the difference of partial pressures in the blood and in the tissues. If the partial pressure in the blood remains constant the intake will depend on the pressures in the tissues. Most textbooks state that the tension in the tissues is zero, and hence we should be forced to the conclusion that the rate of absorption cannot be increased.

There is probably an oxygen tension in the tissues, as Ehrlich was able to show a difference in the reduction of alizarine blue by different tissues.[8] By the time a portion of tissue had been exhausted by the mercury pump, the oxygen may have been used up by the tissue.

The following suggests the outline of the process of oxygen absorption. Associated with activity the oxygen pressure in the tissue is diminished, with the result that the rate of oxygen intake is increased. This rate of increase will continue until the oxygen pressure is restored to the resting value. The oxygen tension in the blood will be maintained by an increased blood flow and by the action of the products of activity on the oxyhaemoglobin.

A special form of gaseous metabolism is that which occurs under anaërobic conditions. In this case there can be no oxygen absorption but only an output of carbon dioxide.

The energy for cellular processes must be obtained by some molecular rearrangement. Alcoholic fermentation is an example of this process. All the anaërobic decompositions yield much less total energy than the decomposition of the same substances in the presence of oxygen. Not only plants but animals (for example, intestinal worms) can live under anaërobic conditions,[9] but less than 25 per cent. of the total energy is produced.

The intermediate steps in the process of oxidation are not known. The oxidation of sugar has been considered analogous to alcoholic fermentation. Lactic acid, glyceric aldehyde, alcohol, etc., have been suggested as intermediate substances. Lactic acid has been shown to be formed during muscular contraction, but it is not necessarily an intermediate substance; it may not be formed from sugar and it is stated to be turned back into its precursor and not oxidized further.

The breakdown of fat is probably preceded by desaturation, and it seems probable that the seat of desaturation is the liver.

This brief outline of the processes involved in tissue respiration is intended to emphasize the importance of treating the subject from the dynamical point of view of modern chemistry.

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II.—H. M. VERNON, M.A., M.D.,

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(From the Physiological Laboratory, Oxford.)

ONE of the most difficult questions in the subject of tissue respiration is to determine the actual mechanism of breakdown of the proteins, fats and carbohydrates of the tissues, and their ultimate oxidation to carbon dioxide and water. In anaërobic organisms such processes occur in the complete absence of oxygen, and a good deal of evidence has been accumulated, more especially by Buchner, to show that these processes are dependent on enzymes. Thus zymase splits up sugar into CO_2 and alcohol. Lactacidase converts lactic acid into the same products. Acetic acid, formic acid, glycerine, and other substances are also formed from sugar by enzyme action. In aërobic organisms it is very probable that similar decomposition changes still occur, and they may form the first stage in the breakdown of some of the foodstuffs; but as sources of energy they are of comparatively small value compared with the oxidation processes. For instance, the conversion of sugar into CO_2 and alcohol causes the evolution of only 11 per cent. of the total energy liberated by its complete oxidation to $CO_2 + H_2O$. Hence the elucidation of the mechanism of such oxidation processes is a matter of special importance. Evidence is accumulating, though as yet it is far from complete, to show that they are dependent on oxidizing enzymes.

Arguing from the results of their observations on vegetable enzymes, Bach and Chodat have concluded that the tissues contain two classes of oxidizing enzymes—namely, oxygenases, or enzymes which take up molecular oxygen and transfer it to suitable organic substances with the formation of peroxides, and peroxidases, or activators which assist in the transference of this active peroxide oxygen to oxidizable substances, and so greatly

heighten its oxidizing powers. The existence of these two classes of oxidases in animal tissues is generally accepted, though some investigators suppose the oxygenase to be itself the organic peroxide, and others, such as Moore and Whitley, maintain that there is no adequate proof of its enzymic nature. They look upon it simply as a suitable organic substance which has taken up molecular oxygen and been converted into a peroxide; but the experiments which I have recently been making on indophenol oxidase point to its enzymic nature, for they show that it is rapidly destroyed even at 50° C., and that the amount of oxidation it effects varies, under suitable conditions, in direct proportion to the time of action.

The existence of oxygenase and peroxidase is strongly supported by the analogy of certain inorganic oxidizing processes. It was shown by Fenton in 1894 that hydrogen peroxide, in the presence of a trace of activator such as ferrous sulphate, could readily oxidize tartaric acid, and Dakin has shown that this process can be applied to many other organic substances. It can oxidize amino acids, such as $R.CH.NH_2.COOH$ to $NH_3 + CO_2 + R.CHO$. The aldehyde is then oxidized to the corresponding acid, this acid is in turn split up into CO_2 and a lower aldehyde, and ultimately is oxidized completely into $CO_2 + H_2O$. The ammonium salts of all saturated fatty acids from stearic down to formic can be gradually broken down in the same way, and are converted, at least in part, into CO_2 and H_2O. The remarkable point about these reactions is that they occur at body temperature, and if it can be shown that the oxygenase + peroxidase of the tissues are able to effect similar oxidations, we should be justified in assuming that the oxidation processes of protoplasm are the work of intracellular enzymes. Up to the present evidence of such oxidizing powers has not been forthcoming. Battelli and Stern have extracted a uricase enzyme from the tissues, which oxidizes uric acid to CO_2 and allantoin. Kostytschew prepared a peroxidase from germinating wheat which had considerable oxidizing powers in presence of H_2O_2, for if added to glucose which had been fermented for one to three hours with zymase and then boiled, it formed a good deal of CO_2. But for the most part the oxidizing power of the oxidases appears to be comparatively small. They will oxidize guaiaconic acid to guaiacum blue, pyrogallol to purpurogallin, a mixture of *a*-naphthol and paraphenylene-diamine to indophenol, and so on; but even their supposed power of oxidizing salicylaldehyde to salicylic acid has been shown by Battelli and Stern to be no oxidation at all, but a hydrolysis of the aldehyde to saligenin and salicylic acid.

Again, Battelli and Stern have shown that if tissues be minced up shortly after removal from a freshly-killed animal and be mixed with blood or saline and kept in an atmosphere of oxygen, they at first form CO_2 and absorb oxygen at a greater rate than the normal living tissue; but in a few minutes these respiratory powers rapidly dwindle, and in an hour or two may sink to zero. I have found that the oxidases of minced tissues remain in undiminished strength for twenty-four hours or more, so the failure of the respiration is not due to them. Also I have investigated the action of a number of different conditions on the respiratory powers and oxidase content of living tissues to see how far they correspond. Most of my experiments were made on freshly excised mammalian kidneys, as they are the most convenient organs to determine the gaseous metabolism of. I found that on heating kidneys for half an hour to 50°, cooling them, and estimating their respiratory power, about half of it was lost, whilst after heating to 53° three-fourths was lost. The oxidase of the tissues (indophenol oxidase) underwent a similar degree of destruction. Also on perfusing kidneys for half an hour with saline containing 0.1 to 0.4 per cent. of lactic acid, they showed parallel losses of respiratory power and of oxidase. Other poisons, such as chloroform and methylamine, acted rather less destructively on oxidase than on respiration; others, such as ammonia, still less so; and others, such as formaldehyde, less still. In fact, these and other experiments showed that there is some link in the chain of oxidation processes which a poison can destroy without its necessarily injuring the oxidases at all. As I hope to prove to you on a subsequent occasion, this link is probably a lipoid membrane.

The dependence of respiration on oxidases is supported by the fact that the richness of the tissues in these enzymes varies to some extent with the magnitude of their respiration. Thus I found that the tissues of birds are richer in oxidase than the tissues of mammals, whilst these again are very much richer than the tissues of cold-blooded animals. Also the smaller an animal the greater the oxidase content of its tissues. Canaries and sparrows, which have about seven times the respiratory exchange of the goose, have about twice as much oxidase in their tissues, whilst birds of intermediate size have intermediate amounts of oxidase. Of individual tissues, those possessing powers of sustained activity, such as the heart, diaphragm, and the pectoral muscles of flying birds, are richest in oxidase, whilst liver and lung are the poorest. The grey matter of the brain contains five times more oxidase than the white matter; the renal cortex ten times more than the papillary zone of the medulla. The amount of oxidase seems to run parallel with the amount of intramolecular oxygen which is supposed to be stored up in the tissues. Ehrlich found that when animals were injected *intra vitam* with various stains, and were examined immediately after death, certain tissues failed to reduce the indophenol blue injected, and so he regarded them as highly saturated with oxygen. Others reduced indophenol blue, but failed to reduce the more stable alizarin blue. Others reduced alizarin blue as well, and so he regarded them as of the highest degree of oxygen avidity. These latter tissues I find to be very poor in oxidase, whilst the tissues highly saturated with oxygen are all very rich in oxidase. It must be mentioned, however, that some investigators deny the existence of intramolecular oxygen in the tissues, but the evidence either for or against it is not conclusive.

DISCUSSION.

Professor BAINBRIDGE (Medical School, Newcastle-on-Tyne) pointed out that Barcroft's observations as to the oxygen intake of the renal glomeruli were not conclusive as to their functions. The bulk of the glomeruli in relation to that of the tubules as a whole was so insignificant (probably less than 5 per cent.) that an increase of oxygen intake during activity of the glomeruli might well occur, which might be masked by the activity of the kidney as a whole, and fall within the limits of the experimental error of the method used.

Professor T. H. MILROY (Belfast) said: Oxidation processes may at one time be expressed mainly by the absorption of oxygen, and at another by the excretion of the carbonic acid. The amount of oxygen absorbed is very largely dependent upon the rate of the blood flow. For example, in apnoea produced by experimental pulmonary ventilation, there is evidently a marked slowing of the blood flow, and so, as Ewald has pointed out, the arterial blood shows an increased oxygen content, while the venous blood is poorer in oxygen. In the recovery from apnoea the oxygen is more rapidly absorbed than the carbonic acid is formed.

THE FUNCTION OF LIPOIDS IN VITAL PROCESSES.

By H. M. VERNON, M.A., M.D.,
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(From the Physiological Laboratory, Oxford.)

ALL living tissues contain lipoid substances, which are now thought to be no less an essential constituent of protoplasm than the proteins themselves. They are largely composed of lecithin and cholesterin, probably in ester-like combination. Protoplasm has been regarded as an emulsion of proteins and lipoids, whilst Overton compares it to a swollen sponge, the fibres of which correspond to the protoplasmic framework, and the spaces in between to the water of imbibition of the protoplasm, or vacuoles containing dextrose, salts, and unorganized protein in solution. Separating the framework and the vacuoles are lipoid membranes. The lipoids form a kind of cement holding together the various constituents of the protoplasm, and any substance which dissolves in them alters their physical condition and their cohesive power. According to Meyer and Overton the narcotic action of alcohols,

ether, chloroform, and similar substances depends on their solution in these lipoids, and the greater their solvent power the greater their narcotic action. Determinations of the partition coefficients of various narcotics as between oil and water give values roughly corresponding to their relative narcotizing action on tadpoles and other small organisms.

Further information as to the function of lipoids can be obtained by investigating the action of considerable concentrations of suitable narcotics on living tissues. In the experiments which I wish to describe I have practically confined myself to monohydric alcohols of the aliphatic series, more especially to ethyl, propyl and butyl alcohols. I have perfused freshly excised rabbit's kidneys for half an hour with saline containing suitable concentrations of these alcohols, and have determined their influence on the gaseous metabolism and the oxidase content of the tissues. After poisoning with the alcohol the kidney was perfused with oxygenated Ringer's solution, and by analysing the gases in samples of it before and after perfusion, the CO_2 output and oxygen intake of the kidney were ascertained. Finally the oxidase content was determined by allowing a weighed sample of the minced kidney to act on a mixture of *a*-naphthol and paraphenylene-diamine for an hour, and determining the amount of indophenol formed by extracting it with alcohol and estimating it colorimetrically.

The results obtained are best described in terms of the concentrations of the alcohols found by Overton to produce narcosis in tadpoles—namely, 0.29 gram molecule of ethyl alcohol, 0.11 M of propyl alcohol, and 0.038 M of butyl alcohol. Before any permanent reduction was produced in the gaseous metabolism it was necessary to perfuse the kidneys with about ten times the respective concentrations of these alcohols. Smaller concentrations than these excited the tissues to increased respiration, but probably the actual injury effect began approximately at the concentrations of 3.24 M ethyl alcohol, 1.08 M propyl alcohol, and 0.32 M butyl alcohol. Now these are the concentrations found by Führer and Neubauer to lake red blood corpuscles, and which in their case almost certainly dissolve or destroy lipoid membranes. Hence it seems very probable that the destructive influence on the tissue respiration is likewise due to destruction of lipoid membranes.

In order to destroy the whole of the respiratory powers of the kidney tissues in half an hour, it was necessary to perfuse with 11.5 M ethyl alcohol, 4.1 M propyl alcohol, and 1.14 M butyl alcohol. These concentrations were also just sufficient to destroy the whole of the kidney oxidase, but the concentrations which first began to injure the respiration had little or no action on the oxidase. If fresh kidney were minced up, and were subjected to various concentrations of the alcohols for half an hour, its oxidase was found to be considerably more affected than was the oxidase of intact kidneys. Still it was not injured by the laking concentrations of the alcohols above mentioned, except in the case of the liver. The oxidase of this tissue was distinctly more sensitive to the destructive action of the alcohols than that of the kidney, and began to be affected almost exactly at the laking concentrations.

The reaction of the oxidase of minced tissues to the alcohols is a very sharp one. Thus all concentrations of methyl alcohol up to 10.5 M (a 42 per cent. solution by volume) had no action on it at all, whilst 14 M methyl alcohol destroyed it completely. Intermediate concentrations produced intermediate effects. In the case of ethyl alcohol, the limiting concentrations were 4.8 M and 8.0 M; for propyl alcohol they were 1.5 M and 2.75 M; for butyl alcohol, 0.32 M and 0.9 M. Other narcotics, such as chloroform, ether, ethyl acetate, ethyl urethane, and phenol, had a similar destructive action on the oxidase, and so presumably they act by destroying some lipoid membrane, perhaps a membrane which holds together the oxygenase and peroxidase enzymes of the tissues, and enables them to act in concert.

Narcotics, if in sufficient concentration, destroy the lipoid membranes which hold together the protein constituents of the cells. Thus, on perfusing kidneys with all concentrations of propyl alcohol up to 2.5 M, only 3 per cent. or less of the tissue protein was washed out by the perfusing liquid, but 3.0 M propyl alcohol caused so much breakdown of the cells that no less than 14 per cent. of the total protein contents of the kidney were washed out in half an hour. Butyl alcohol acted more powerfully still, for, whilst all concentrations up to 0.5 M removed 2 per cent. or less of the protein, 0.8 M removed 13 per cent., and 0.9 M no less than 29 per cent. of it. Ethyl alcohol acted less powerfully, for, whilst all concentrations up to 7 M removed 2 per cent. or less of the protein, 8 M removed 7 per cent., and 10 M 9.4 per cent. of it.

It might be thought that the physical changes produced in living tissues by these high concentrations of alcohols can have but little in common with those produced by the very much smaller narcotizing concentrations, but there is evidence which suggests that the difference may be only one of degree. Thus the maximum narcotizing concentrations of the alcohols for tadpoles (that is, those just insufficient to kill) are about five times greater than the minimum values given above, and are therefore about half as great as the concentrations which begin to destroy tissue respiration and oxidase. It is evident that these maximum narcotizing concentrations cannot produce any permanent physical change in the tissue lipoids. Only when they are double as great do they begin actually to dissolve and destroy the sensitive lipoid membranes which form a link in the chain of respiratory processes. At a slightly greater concentration they destroy the membranes which enable the oxidases to act, and at a greater one still they destroy the membranes which hold together the protein constituents of the tissues.

ESTIMATION OF THE UREA IN URINE.

By J. A. MILROY, M.D.,

Queen's University, Belfast.

THE following rapid method for determining the urea in urine consists of four stages: (1) Precipitation of the phosphates of the urine with baryta mixture, the mixture being made up so that the urine is finally diluted with an equal volume of fluid. (2) Determination of the preformed ammonia and amine derivatives in an aliquot portion of the filtrate by formol titration, using two indicators—methyl red for the determination of the neutral point, and phenolphthalein for the titration of the acid set free by the addition of the neutral formol. (3) Hydrolysis of the filtrate; 10 c.cm. portions of the filtrate are placed in test tubes covered with lead foil and heated in the autoclave with an equal volume of normal acid—either sulphuric or hydrochloric—at 155° C. for one and a half hours. (4) Determination of the ammonia and amine derivatives in the hydrolysed urine by means of formol titration, methyl red being used in determining the neutral point.

The result of step (4) *minus* the result obtained in step (2) gives the amount of urea expressed in c.cm. of decinormal alkali (1 c.cm. of decinormal alkali = 0.003 gram urea) present in 5 c.cm. of urine.

OBSERVATIONS ON THE PRODUCTION OF APNOEA.

By Professor T. H. MILROY, M.D.,

Physiological Laboratory, Queen's University, Belfast.

THERE are at least two factors concerned in the regulation of breathing to which attention must be directed, namely:

(*a*) The intrinsic excitability of the respiratory centre.
(*b*) The reflex and other mechanisms that may alter the excitability.

As regards the former, it is extremely difficult to ascertain whether the respiratory centre discharges rhythmically in the absence of all afferent (reflex) stimuli, as it is difficult, if not impossible, to be sure that all afferent channels have been interrupted; and even if this were accomplished, as the traumatic lesions are so severe, it is difficult to exclude the possibility of the injured parts themselves exciting the centre.

Whatever view be held as regards the automaticity of the respiratory centre, it is evident that this centre is very much under the influence of two kinds of excitations—namely, the gaseous constituents of the blood and afferent nervous stimuli which reach it from the lungs, respiratory muscles, etc. The most evident and the most carefully studied departures from the normal rhythm of breathing

are due to changes in the amounts of carbonic acid and oxygen in the blood, and of these two gases the former is regarded at present as the important excitant of the centre. For example, an increase of 2 per cent. of an atmosphere in the carbonic acid of the alveolar air, when the total CO_2 pressure is between 5 per cent. and 6 per cent. of an atmosphere, doubles the pulmonary ventilation. Diminution of oxygen also leads to an increase in the excitability of the centre, but only when the oxygen percentage of the inspired air falls below 13 per cent. of an atmosphere. Just as an increase in the CO_2 alveolar pressure leads to an increase in pulmonary ventilation, so does a fall in the same gas lead at last to a stoppage of breathing when the CO_2 content of the blood supplied to the respiratory centre falls below a certain value. The activity of the centre then remains in abeyance until the gradually accumulating carbonic acid, and also the accumulated acid products of insufficient oxidation, lead to a renewed excitement of the centre.

In certain conditions the excitability of the centre may be markedly lowered, so that with any slight fall in the carbonic acid content of the blood the centre may cease discharging nervous impulses, and, as a result of the insufficient pulmonary ventilation, the carbonic acid rises to an amount that will again excite the centre to activity, at first slightly, then to a greater extent. With the increased respiratory activity the CO_2 is again washed out of the blood and the centre becomes inactive. Such successive hyperpnoeic and apnoeic periods are seen in the Cheyne-Stokes type of respiration. If an air mixture to which a small quantity of carbonic acid is added be given during the period of lessened respiration, the respirations at once become deeper.

Recently much evidence has been brought forward in support of the view that the CO_2 content of the blood is of maximal importance in respiratory regulation.

There is, however, no doubt that the normal rhythm is dependent upon another factor, namely, a nervous one, and especially is this true of the afferent path by the vagi from the lungs to the respiratory centre.

When the vagi are cut the breathing becomes markedly altered, the respirations being slow and deep. At one time this was supposed to be due to a stimulation arising at the central ends of the cut afferent fibres, but freezing the vagi produces exactly the same effect as section.

The vagi seem to be mainly concerned in the conveyance of inhibitory impulses which are set up by distension of the lung alveoli, these impulses checking the further course of inspiration so that the expiratory recoil occurs.

In my research I have been mainly concerned in the attempt to determine the extent to which each factor, the gaseous and the nervous, plays a part in the regulation.

In the investigation of the nervous factor it is advisable to study the changes produced in respiration after as slight traumatic interference as possible.

If the afferent nerve fibres from the alternately distending and collapsing lung alveoli influence the respiratory rhythm independently altogether of gaseous alterations, one ought to be able to produce different effects on the respiratory centre according as one artificially ventilates the lungs at a fast or at a slow rate, even when the total pulmonary ventilation over a given time remains the same in the two cases.

In the first experiments artificial respiration was carried out in the cat at different rates of pumping, keeping the total pulmonary ventilation the same. For example, 70 c.cm. air or other gas mixture were pumped in sixty times per minute for five minutes, and a record taken of the nature of the breathing after the pumping, and, subsequently, 70 c.cm. air or other gas mixture were passed through at a rate of 120 per minute for two and a half minutes, and again a record of the recovery of respiration taken.

Or again, volumes and rates were altered as follows: 50 c.cm. air pumped in 100 times per minute for five minutes, and recovery recorded. Then 100 c.cm. air were given at a rate of fifty times per minute for five minutes, and recovery recorded.

In the former case the lungs were distended to the same extent at each stroke of the pump, but in the one case at double the rate of the other, the total pulmonary ventilation being the same.

In the latter case degree of distension and rate were both altered, but in the two cases the total pulmonary ventilation remained the same.

In both series of experiments when air was employed apnoea or stoppage of breathing resulted, the duration of which depended upon the total pulmonary ventilation, not being affected by the rate of pumping nor by variations in the distension of the lungs so long as the total pulmonary ventilation remained the same. In cases, however, where the lungs have been distended with large volumes of air, the first few breaths after the apnoea may be very irregular in character. Thus we see that with variations in the rate or degree of distension and so with variations in the rate and degree of the afferent stimuli arising in the alveoli there is no distinct difference in the duration of the apnoea or in the type of recovery after the apnoea.

In the second series of experiments the vagi were frozen before artificial respiration was carried out, the breathing as a result becoming slow and deep. Then pumping was carried out in the same way as in the first series. Apnoea was produced in all cases just as when the vagi were intact and the duration of the apnoea was much the same as in the latter case.

The breathing after the apnoea is very apt to be irregular but the rate is slow, being similar to that occurring before the artificial respiration.

It is thus seen that so far as effects upon the respiratory centre are concerned, variations in the stimuli reaching it from the lungs along the vagi produce no characteristic disturbance in the apnoea or in the recovery after the apnoea, nor does complete removal of the vagal influence interfere with the production of apnoea.

In the third series of experiments various gas mixtures were given, and it was soon found that very slight variations in the CO_2 percentage of the gas mixture affected very markedly the duration of the apnoea. Thus, if a gas mixture containing the normal percentage of oxygen in air and 0.5 per cent. CO_2 were pumped into the lungs no apnoea is produced in most cases. With slightly larger quantities of carbonic acid the breathing after the artificial respiration is exaggerated and often very irregular and of the Cheyne-Stokes variety.

If the vagi are frozen before these gas mixtures are pumped, there is also no cessation of breathing; but when the breathing does start, it is regular at the outset, and thus differs from artificial respiration with air with the vagi cut. The breathing afterwards may become irregular, but its average rate is not above the slow rate existing before pumping.

Gas mixtures rich in oxygen prolong the apnoea, even if only a few breaths of oxygen are given after the main ventilation has been carried out with air.

The most important factor in the production of apnoea is undoubtedly the washing out of the carbonic acid from the blood. If this is prevented, apnoea does not occur. Oxygen prolongs the duration of apnoea, but moderate diminution in its amount will not prevent the production of the apnoea. The nervous factor is of minor importance.

At the outset of apnoea there is a rapid consumption of oxygen, and if a gas mixture rich in oxygen be introduced on stoppage of the pulmonary ventilation, the apnoeic pause is much prolonged. The carbonic acid which accumulates during the period of apnoea passes out into the alveoli, the rate of passage being approximately the same when the gas mixture is air or nitrogen, or mixtures of oxygen and nitrogen in various proportions. When the alveoli are filled with nitrogen, oxygen as well as carbonic acid passes out. When a mixture rich in CO_2 is pumped into the alveoli at the close of a prolonged pulmonary ventilation with air, the CO_2 leaves the mixture and rapidly passes into the blood, shortening the period of apnoea.

ANIMAL ACTIVITIES IN RELATION TO TRAINING.

By Professor R. J. ANDERSON, M.D.

THE effects of fine training on animals have been, in part, attributed to the skill of the trainer, and in part to hereditary tendencies. Professor Zeigler points out that those practical actions not derived from experience are apt

to be hereditary. The ease with which an animal takes training depends on previous experiences, practice, and tendencies. The character and condition of the muscles and sense organs and their structure affect, or modify, the results of experience. The great Dane that died of starvation in a room where he was locked in with game, the dog that leaves its pups to follow its master, the collie that forgets about his food when a prevailing passion seizes him (whether it be the management of a flock of sheep, the retrieving of a stick, or the guarding of his master's property), are regarded as examples of training young and susceptible animals. Adjustments and readjustments are difficult to isolate.

Instinct, so-called, is likely to be racial or tribal. Indeed, the term is used by many in that sense alone. Professor Bohn believes that the term should be discarded. When an animal is easily trained one often attributes the facility to hereditary causes rather than to training because of the methods observed in selection. The dog that hunts rabbits and brings them to his master, acting on his own account, may be acting from racial tendencies, and so may the cat that brings a young rabbit, a rat, or a mouse to a friend. A cat may not be discriminating and may bring a dead kitten to her mistress, but this attention is a transference.

The effects of training may lead a dog, blind with passion, to savage his master, or kill his master's child. Here again there is a transference. A collie I knew joined in a fight between members of his own species readily, but became a peacemaker when he saw two oxen or two fowls fighting. The latter tendencies were the results of mixed impressions. Constraint as well as reward becomes an efficient means of training in horses.

In man, outside pathological domains, prevailing impressions have been known to carry him very far, although they are not so likely to become purely reflex as in other animals, and avenues to impressions through psychic centres increase the number and range, at least, of these. In training one is less concerned with the laws of reflex actions than with the influence of associated stimuli. Sound, odour, light, cooling of the skin surface locally, heat, local rubbing of a peculiar kind, have been made to produce salivation (Pawlow, and his pupils, Boldyrew, and others). Terror, fascination, hypnotism are among the effects of impressions received from without. Birds, fish, and crustacea have been hypnotized.

These find parallels in the psychic effects of certain medicines in man that have the therapeutic effects they are expected to produce. One has a better chance of seeing some reflex operations and of seeing their growing automatism in the lower animals. An Irish terrier showed a disposition to kill poultry. He was cured by inflicting a certain amount of pain in the region of his tail. Some time after the cure was complete this young dog quite ran away from a flock of chickens he happened to meet when following his master. There are other instances comparable in intention with some of the stories told to intimidate or horrify the youthful mind in man. In animals the cure is often worse than the disease. It is said that in man some of the peculiar troubles associated with neurasthenia and ending with the termination *phobia* may be traced to these psychic horrors of childhood. Amongst persistency of impressions I may mention the instance of a dog licking his lips when he sees a friend who gave him sugar on previous occasions. The influence of glands (internal) has attracted the attention of a good many observers. Dr. Laignst Lavastine has suggested that the psychic effects of diseases of the closed glands, adenoids, thyroids, etc., should claim the attention of physiologist, pathologist, anatomist, and therapeutist.

It is not too much to suggest that the study of change of activity associated with gland change comes within the domain of the working biologist. Human activities in some of their simplest phases may be studied in domestic animals and some others less familiar to us. If attention be paid to the details of training one cannot fail to gain clearer results with reference to the aspects of human movements.

THE eighty-fourth meeting of the German Association of Scientists and Medical Practitioners, recently held at Münster, was very successful. Next year the meeting will be held at Vienna, under the presidency of Professor H. H. Meyer.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

THE TUBERCULIN TREATMENT OF CONSUMPTION.

THE correspondence on this subject interests the majority of the profession profoundly. The mode of using this potent agent, tuberculin, is one that can hardly be settled by definite laboratory biological experiment—its action and reactions are admittedly so complicated. The data for its beneficial administration must therefore be worked out clinically. I have had the pleasure of hearing Dr. Camac Wilkinson lecture on the subject, but I regret to have to say I knew as much about his massive doses before as I did afterwards, and that was nil. My friend, Fleet Surgeon Acheson, R.N., and others, have borne testimony of the good results they have seen in his tuberculin dispensary, so no doubt the treatment he adopts is productive of great good.

I have been using tuberculin in the treatment of consumptives in the in-patient and out-patient departments of this hospital for six years. At first I used T.R. according to the directions issued with the preparation, but my results were worse than unsatisfactory as a rule. I now use mixed tuberculin, T.R. and *Perlsucht-tuberkulin*, which I dilute and mix myself, and my results are decidedly good, but preparatory treatment is invariably adopted. Cod-liver oil and minute doses of creosote are always given for a few weeks first. If the sputum is profuse and especially if there are symptoms of mixed infection (hectic, etc.), moist continuous inhalations of formalin, iodine, menthol, etc., are used until this is corrected. Haemorrhage is completely controlled. The patient, in other words, is prepared for the course, and of late my preparation does not end at this. Now for five days before giving a tuberculin injection $\frac{1}{40}$ to $\frac{1}{30}$ of a grain of strychnine hydrochloride is injected intramuscularly daily. Since I have used this latter preparatory treatment no bad results of any kind have followed the tuberculin injections, and I find I can give large doses more quickly. I might theorize much on how the strychnine acts, so can anybody else, and I will leave it at that. Strychnine by the mouth has not the same good effects: it will often cause griping and diarrhoea. The drug administered intramuscularly seems to exert a decided beneficial effect all round, improving the general condition and appetite, and helping to clear the sputa of tubercle bacillus.

JOSEPH H. WHELAN, M.D.,
Fleet Surgeon, R.N.(ret.)

Royal Hamadryad Seamen's Hospital, Cardiff.

TREATMENT OF CHRONIC DYSENTERY BY EMETINE SALTS.

IN confirmation of Dr. Leonard Rogers's instructive papers in the JOURNAL of June 22nd and August 24th last, it may be of interest to record the successful treatment of a case of chronic dysentery of ten years' duration by hypodermic injections of emetine hydrochloride.

The patient, a male aged 40 years, acquired dysentery in the Boer war in 1901 and again in 1902. Although discharged from hospital as cured his motions had remained very frequent, accompanied by a good deal of tenesmus. When he came to me in July last he had about ten or eleven evacuations daily, mostly of mucus and blood. If he contemplated a walk of any distance he had to plan out places of call beforehand.

After reading the successful results recorded by Dr. Leonard Rogers in his first paper, I thought it a pity not to give the man a chance of cure, although I rather hesitated when I found it noted that the South African dysentery was not of the amoebic form. I explained this to the patient as far as I could, and told him he must not rely on benefiting by the treatment, but his constant ill health and the annoyance was so great that he was willing to take his chance. The solution used was 1 grain of emetine hydrochloride in 30 minims of water. Starting with $\frac{1}{6}$ grain dose, this was increased to $\frac{1}{4}$ grain, then $\frac{1}{2}$ grain. In all nine injections of the solution were given, totalling $2\frac{3}{4}$ grains of the salt.

Immediate improvement resulted; some days before the termination of the treatment his bowels acted normally

once a day, the stools being of a natural consistency. This was in July, and he has remained well till now. No vomiting or other drawbacks occurred; there was slight local irritation at the sites of injection.

Possibly half the quantity of the drug might have sufficed, but considering the duration of the disease it was thought better to give more than might be absolutely necessary rather than risk giving too little.

London. J. WARD LAWSON, M.R.C.S.Eng.

EPIDEMIC JAUNDICE.

OCCASIONALLY during the past fifteen years I have had to deal with epidemics of jaundice occurring in the spring and summer months. This year an epidemic has again broken out, and as the disease is much more severe in its onset, intensity, and duration, I think it is worthy of record.

The age incidence is from 6 to 16 years, and a typical case runs as follows: The child is noticed to be sick, looks pale, and has little or no appetite. On the same evening pains in the back and legs are complained of, and the patient is put to bed. The pulse is quick. The skin is felt to be hot, and if the temperature is taken the thermometer will register 100°–102°. Next day there is great tenderness over the epigastrium; the liver is found to be enlarged, quite tender to the touch, and there is enlargement of the spleen. Slight icterus of the conjunctiva is present, and the bowels are constipated. The urine is very dark, from the presence of bile pigments. On the evening of the second day vomiting sets in, lasting twelve to eighteen hours. The jaundice now is very deep, and the pulse slows and great prostration is complained of. The discoloration remains for an uncertain period; usually lasting a few weeks, it went on in one of my cases to two months, so much so that I feared sarcoma. He, however, gradually improved, and is now quite restored to health.

Wet seasons seem to favour the outbreaks, and as this has been an exceptionally wet summer it would be interesting for me to know if others have met similar cases. The incubation period seems to be rather long, varying from five to twenty-one days.

I believe these cases to be a mild type of Weil's disease, though the age incidence and length of the fever do not tally with the meagre description in the textbooks. The points in favour of my view are (1) the great weakness, (2) the intensity and duration of the jaundice, (3) the feverish onset, (4) the season in which the outbreak occurs.

The treatment was simple. If the bowels had not been relieved an enema was administered. A mixture of sod. salicyl., tinct. rhei. co., and inf. gent. was prescribed, and later, tonics. The diet consisted at first of skim milk, and later on beef-tea, toast, etc. All the patients recovered.

Dunlavin, co. Wicklow. EDWARD LYONS, M.D., D.P.H. (Univ. Dubl.).

WIRING THE SAME FRACTURED PATELLA TWICE.

THE cases recorded in the JOURNAL of June 1st and 8th are paralleled by one that I had to deal with nearly ten years ago. In November, 1903, a woman aged 42 was admitted to the South Devon Hospital with a fractured patella of six weeks' standing, and I wired the fragments, the patient going out in a knee splint seven weeks later. In three months she was readmitted, having fallen downstairs while intoxicated, and re-fractured the same patella. I re-wired her, using two strands, and reinforcing the aponeuroses with kangaroo tendon, and she made a good recovery. I saw her afterwards with a very useful knee.

C. E. RUSSEL RENDLE,
Late Assistant Surgeon, South Devon and East Cornwall Hospital.

DEATH SOON AFTER THE USE OF DIPHTHERIA ANTITOXIN.

ON July 25th, 1912, I was called to see a child, aged 2 years and 10 months, because it was "choky in the chest." I found that it had a sore throat; there were yellow patches on both tonsils. The throat had more the appearance of a septic throat than that of diphtheria, but I thought it advisable to give a dose of diphtheria antitoxin, and gave 4,000 units. The child, whilst I was preparing my syringe, etc., was crying excessively; the cry was not at all hoarse, and there was no question of laryngeal obstruction. This was at about 3 p.m. I left the house not feeling alarmed about the child, as it did not seem seriously ill. An hour afterwards convulsions set in, and, in spite of treatment, the child died at 6.45 p.m. The child had had no injection before. It was not subject to bronchitis. There was no bleeding from the needle puncture, and the serum formed a big swelling subcutaneously, so it is not likely that I punctured a vein. No *post-mortem* examination was made.

Durham. ARTHUR PAIN, M.R.C.S., L.R.C.P.

RAPID RECOVERY AFTER OPERATION FOR CHRONIC APPENDICITIS.

PRIVATE U., Sherwood Foresters, was operated on for chronic appendicitis on June 15th, 1912, under spinal analgesia. The appendix was much inflamed, twisted twice on its long axis, and also kinked. It was removed through an inch incision close to the anterior superior spine and by splitting the muscles. He left hospital to attend as an out-patient fourteen days later. He started on July 15th to train for a "Marathon race," and at first was able to do four miles. This distance he increased to six miles after a fortnight's training, and he can do eight miles now without discomfort. His time for six miles is 46 minutes. I may add that this has been done without my knowledge, but he seems none the worse for his exertions.

Secunderabad. F. J. W. PORTER, D.S.O., Major, R.A.M.C.

Reports
ON
MEDICAL AND SURGICAL PRACTICE IN THE HOSPITALS AND ASYLUMS OF THE BRITISH EMPIRE.

GREAT YARMOUTH HOSPITAL.

A CASE OF DELAYED CHLOROFORM POISONING.

(Under the care of Mr. HENRY WYLLYS, F.R.C.S.Edin.)

[Reported by JOSEPH GEOGHEGAN, M.B., Ch.B.Edin., late House-Surgeon.]

ON July 14th, J. A., a girl aged 16, was admitted with the following history. On July 11th, in the late afternoon, she was seized with a sudden attack of severe pain in the abdomen. She had been constipated for four days, and had during the day or two immediately before suffered from some uneasiness. The pain continued intermittently, and on the evening of July 12th she called in the doctor, who found the temperature 100°, pulse 108, tongue dirty, abdomen not distended but tender on deep pressure, 1½ in. inside the right superior iliac spine. She had been sick several times. Her bowels had acted once that day, after a Seidlitz powder. Next morning her temperature was 100.6°, and pulse 110; the abdomen was more tender, but she had not been sick. Before sending her into hospital, which was done the following morning, an enema was given, with two good results.

When admitted under Mr. Wyllys the temperature was 101°, pulse 128, respirations 32; urine acid, specific gravity 1020, no sugar or albumen. Her tongue was furred and dirty, and the skin sallow and hot, but her general appearance was good. The abdomen was tender on the right side and flank, and particularly posteriorly above the crest of the ilium. Dullness could be made out in the right flank. Below the umbilicus the abdomen was rigid, the right rectus being the more resistant. There appeared to be a tumour in the right iliac fossa.

Enemas were given, one in the forenoon and another in the afternoon, with good results; hot fomentations were changed every four hours. In the afternoon the temperature rose to 102.4°, but the pulse subsided somewhat. The operation was performed at 9 p.m., the incision being carried higher and more towards the flank in the belief that a retrocaecal position of the appendix existed, and such was found to be the case. The appendix was kinked, gangrenous, and adherent to the caecum; some fluid was present, but of no particularly offensive odour. A portion of the adjacent caecum, about 2 × 1 in., was sloughy, and all the surrounding tissues were oedematous, soft, and inflamed. Fresh easily-broken down adhesions shut in the infected area. The appendix was removed

by the clamp method; two purse-string sutures were inserted in the caecum, and the wound was closed save for a drainage tube. The operation lasted a little over an hour, and only choloroform was used, 6 drachms being the quantity required.

On coming round the patient was excited and noisy, and hyoscine hydrobromide, $\frac{1}{100}$ grain, was given. She was also put on continuous rectal salines. Subsequently she was again noisy, and only quietened on receiving morphine hydrochloride, $\frac{1}{4}$ grain.

Next morning the temperature was 100.4°, pulse 108, respirations 24. The wound showed only a slight discharge, neither faecal nor over-offensive. The patient looked very much better and was bright and cheerful, and the prognosis was considered favourable. During the day she recommenced menstruating, having only ceased a week before. The temperature and pulse both subsided and calomel, $\frac{1}{2}$ grain every two hours, was commenced About 4 p.m. she began to complain of pain which was attributed to flatulence; later on she vomited black material. About 11 p.m. she was found to have a very rapid pulse—140—and to look flushed and ill. The discharge from the wound was slight and suggested faecal contamination. The abdomen was soft all over save at the line of incision. During the night the temperature subsided, but the pulse-rate kept high. The abdomen showed no rigidity or tenderness next day (July 16th), and there was nothing to suggest further peritoneal infection. The vomiting continued and increased in frequency, becoming typically black (coffee-ground). During the day she began to become unconscious, with low muttering delirium. The temperature fell to 99°. Next morning the temperature was 98.6°, at which it remained till just before death. The pulse was now consistently 140, with intervals still more rapid. She was exceedingly irritable and quite delirious, throwing her arms up with a peculiar gesture, grinding her teeth and shrieking. Sordes appeared on the lips, and the pupils became widely dilated. There was still only slight discharge, the abdomen was soft, and afforded no signs to suggest the cause of her illness. The lungs and heart showed nothing abnormal; her breath was offensive, but not "fruity"; no acetone was present in the urine. Her delirium gradually increased to mania, and she showed signs of collapse; the temperature remained steady, but the pulse became rapid, weak, and thready. That evening she was obviously worse and, the mania being uncontrollable, she was transfused with Ojss of normal saline and digitalin $\frac{1}{100}$ grain was given four-hourly. It had previously been given with strychnine when she collapsed. Omnopon $\frac{1}{3}$ grain and hyoscine $\frac{1}{200}$ grain were given in ʒij of saline. She became prostrate, rapidly sank into coma, with an almost imperceptible pulse, shallow, harsh breathing, drooping chin, and half-shut eyes, and died quietly at about 7 next morning. In the few hours before death the temperature rose from 98.6° to almost 106°.

On *post-mortem* examination nothing definite could be found. The sloughing inflammation had spread somewhat up the colon, but was all shut off. No leak was apparent at the site of the appendix, and no sign could be found of any further spread of peritoneal infection. Cloudy degeneration was present in all the organs, and the spleen was enlarged and congested. The urine contained no acetone, and, except for a concentrated and uratic state, showed nothing to note.

Recently in this hospital there have been observed 4 cases of a similar nature, all showing the syndrome of peritoneal infection, the use of chloroform, delirium and mania, the peculiar thrown-back attitude of the arms, grating of the teeth, and coffee-ground vomiting, without evidence of peritoneal spread. These symptoms started twenty-four to thirty-six hours after operation and terminated in coma and death. Such a clinical entity has already, I believe, been suggested in these columns, but I am unable to lay my hands on the reference. Possibly amongst that group of cases conveniently lumped under the term "toxaemia," similar details may be noticed by those with more extensive material, and it suggests, at any rate, that delayed chloroform poisoning does exist in a modified form without the typical features of acetonaemia.

I desire to express my indebtedness to Mr. Henry Wyllys, F.R.C.S.E., under whose charge the patient was, for leave to use these notes.

Reviews.

"A SYSTEM OF TREATMENT."

IT was said of Gladstone at the time of his death that it would require a syndicate to give a true picture of the many-sided statesman, and that no one man could do justice to the task of writing his life. But if this be true of a statesman, it is still more applicable to therapeutics at a time when the old order is changing so rapidly that no one intellect can fairly hold the scales between the thousand and one conflicting teachings of the present day. Hence the advent of *A System of Treatment*[1] by many writers, whose judicious selection by the editors offers a useful mirror in which the modern views on treatment are faithfully reflected. The title is, perhaps, not very happy, but a glance at the list of contributors and at the subjects dealt with shows a catholicism which at once favourably impresses the casual observer. Indeed, the juxtaposition of the man-of-the-world clinician of the old school with the man-of-the-laboratory bacteriologist of to-day ensures food for remunerative study to the student old or young.

Vols. I and II deal with general medicine and surgery. The principles of treatment are dealt with in an essay by Dr. Mitchell Bruce in the first twenty-five pages of Vol. I. The subject of appendicitis is ably treated by Mr. English, who discusses that vexed question: "Should the appendix be removed after recovery from the operation of incision and drainage of an appendicular abscess?" While guarding himself by the statement that "each case . . . must be considered on its own merits," he is of opinion that "in most cases the surgeon should advise subsequent removal of the appendix." He adds: "Amongst the cases of this nature operated upon at St. George's Hospital there has been no fatality." These are his personal views, but he also gives an impartial summary of other expert opinions which do not coincide with his own. The modern treatment of consumption in its many manifestations is concisely and clearly described by several writers whose authority on sanatoriums, tuberculin, and the artificial production of pneumothorax is generally recognized. A summary of these and other means of combating consumption is given by Dr. ARTHUR LATHAM, who emphasizes the importance of attacking the disease from as many aspects as possible. The treatment of pulmonary tuberculosis by graduated labour is described by Dr. Marcus Paterson, and we would recommend his admirably concise paper to all who are interested in this method, the indications for and against which are not always carefully observed. Sir William Bennett gives an account of varicocele and varicose veins, his interesting paper being admirably illustrated. The illustrations, we would remark in passing, are excellent, and this is particularly the case with drawings designed to show the different stages of various operations. Dr. Herbert French contributes a number of papers on the various forms of anaemia, on chorea, and on haemophilia. An interesting paper on affections of the tongue is contributed by Mr. Jonathan Hutchinson. Venereal diseases are dealt with by Mr. Ernest Lane, who gives short accounts of the treatment of gonorrhoea, soft chancre, syphilis, and impotence. Mr. Arbuthnot Lane also contributes a number of papers, of which that on the operative treatment of fractures is both long, well illustrated, and most useful at a time when the superiority of new methods to old is still uncertain. Gout and gouty conditions are described by Dr. Arthur Luff, and Mr. Lockhart-Mummery contributes many papers, most of which centre about the rectum. Disseminated sclerosis and tabes dorsalis are discussed by Dr. Risien Russell.

Vol. III, which is devoted to special subjects, contains much information on widely different subjects, such as hypnotism and suggestion, anaesthetics, vaccine-therapy, Bier's treatment, serum-therapy, bacterio-therapeutics, climatology, balneo-therapy, electro-therapy, ionic medication, *x*-ray-therapy, light-therapy, mechanical vibration, radiant heat, Zander methods, massage, physical exercises, stammering, voice production, and defects of speech. Bier's treatment finds an eloquent advocate in Mr. H. F.

[1] *A System of Treatment by Many Writers.* Edited by Arthur Latham and T. Crisp English. In four volumes. London: J. and A. Churchill. 1912. (Med. 8vo. 21s. net each vol.)

Waterhouse, who deplores its relative lack of popularity in England. It should, however, be a source of comfort to him that while the popularity of the treatment has somewhat waned in the country of its birth, it is still highly valued in this country. Dr. G. Hamel's description of massage and the Zander methods is full of useful knowledge; and mechanical vibration is treated in a judicial tone by Dr. A. P. Wells, who points out the important differences between it and massage, with which it is so frequently confused. This volume also contains such subjects as tropical diseases, diseases of the nose, nasopharynx, accessory sinuses and pharynx, oesophagus, trachea, larynx, ear, eye, skin, and the teeth.

Delimitation of the spheres of the general practitioner and of the specialist is always difficult, and the efficient general practitioner must be able to take a comprehensive view of the whole, though a detailed knowledge of the specialist's technique is necessary only for the invader. In obstetrics, owing to the relatively scanty provision of maternity hospitals, the specialist's reserve is small, but in gynaecology the reverse is the case; the emergency character of the obstetric case further emphasizes this difference. The writers of the 140 articles in Volume IV have faced the difficulties of their office with more or less success, but their task of presenting a comprehensive view has not been simplified by the alphabetic arrangement of the articles in the individual groups. Thus spondylotomy, by mere accident of the alphabet, finds itself divorced from craniotomy, decapitation, and evisceration, while cleidotomy occurs only in the article on contracted pelvis. The *ante-partum* haemorrhages also suffer from the same cause, and as the very detailed index supplies all that is needful in the way of an alphabetical guide, the editors might well take advantage of it in future editions. While the articles on haemorrhage recite most of the usual methods, they somewhat lack point in impressing the aim of each as against the haemorrhage. There is now a sufficient body of evidence regarding the elastic compression of the aorta (Momburg) to have warranted its mention, and the unfortunately misleading, though classical, term, "kneading the uterus," is still enshrined here. The articles by Dr. Ballantyne on the general management of pregnancy and of puberty and the menopause, and that of Dr. French on medical diseases in pregnant women, are notably sane and well balanced, and represent a very important revision of some views of the textbooks. The paragraphs on asphyxia of the newborn child do not suggest a full perception of the relative importance of asphyxia and of shock, or of the difference of the physiological action of the hot bath in the two. In the gynaecological part the difference of interpretation placed by the writers on their reference is illustrated by comparing the technically detailed articles by Mr. Bonney with the more general and chatty essays of Sir John Bland-Sutton. On the whole the latter will perhaps serve better the purpose of the general practitioner as an indication of what he should lay before his patient. In the gynaecological section the disadvantages of the alphabet are still apparent, though perhaps minimized by the topographical grouping. On the whole the volume does not produce a definite conviction that the alphabetic system as applied to obstetrics and gynaecology offers advantages as an intermediate stage between the short dictionary of treatment and the detailed special textbook.

Reviewers of a book written by many writers often indulge in the platitude that the value of the different articles varies considerably. We would modify this platitude by suggesting that, while some of the forms of treatment described in these volumes are based on accurate knowledge and long experience, others are but yesterday's products which have not been sufficiently tested. While we, therefore, would wish this particular edition a reasonably long life, we would also express the hope that later editions will appear at timely intervals. Of the *System of Treatment*, taken as a whole, it is clear that a work has been produced which, thanks to the liberal and cosmopolitan attitude of the editors, is representative of the world's medical knowledge as a whole. The index supplied with each volume gives references to the contents of all—a point of considerable importance to possessors of all four volumes. Another feature, on which both publishers and editors are to be congratulated, is the simultaneous appearance of all four volumes, which enables the medical profession to acquire at once the latest opinions on every branch of therapeutics.

CLINICAL MANUALS.

THE appearance of a fifth edition of the well-known handbook of *Clinical Methods* by Drs. HUTCHISON and RAINY,[2] shows at once its popularity amongst students of medicine, and the alertness and industry of its authors. Dr. Paton has given his assistance in remodelling the chapter on the blood, and similar help has been rendered in those devoted to the study of the respiratory, urinary, and nervous systems, by Drs. Lovell Gulland, Martin Flack, and Gordon Holmes respectively; Dr. James Ritchie has contributed the chapter dealing with bacteriology.

The volume can be strongly recommended to the student of medicine not only as a bedside guide, but during those periods of study when his attention is directed towards the more technical methods of investigation which are carried out in the clinical laboratory. The authors have preserved the original form of the work, and have in a thoroughly methodical manner described methods of investigation which are accepted at the present time. Quite rightly the niceties of diagnosis do not enter into discussion, the authors being satisfied in general with the methods of investigation rather than with the significance of the results, although opportunities are taken to impress well-established points. The investigation of the stomach contents is well put, and reference is made to the fact that pepsin and rennin enzymes run parallel in their secretion; capital is made of this by supplanting an inquiry for pepsin by one for rennin, which is easier. With regard to the statement that in some functional disorders of the stomach the total acidity of the contents is increased, rising above that of 0.2 per cent. HCl, it should be made clear that this does not mean that the mucous membrane is capable of secreting a juice containing more than 0.2 per cent. HCl, but that in these disturbed conditions the juice found in the stomach contains a larger percentage than in health, owing to the concentration of the fluid after secretion. The test applied to the stools recommended for occult haemorrhage is that of glacial acetic acid, benzidin, and hydrogen peroxide. We are not disposed to agree with the authors in saying that a diastolic pulmonary murmur is excessively rare; no doubt one due to endocarditis and the sequential distortion of the pulmonary cusps is excessively rare, but the murmur described by Dr. Graham Steell, dependent upon the effects of mitral stenosis and high tension in the pulmonary artery, is far from rare. It is satisfactory to see more space given to sphygmomanometric observation, which reveals more of importance than the use of the sphymograph (Dudgeon's). Recent work with the polygraph receives well-deserved attention and "auricular fibrillation" finds its niche. Strong's method for the enumeration of the red corpuscles is described and its advantages over the Thoma-Zeiss method are pointed out. The section dealing with the examination of the urine is one of the best we know, though in a book of this character it is questionable whether cryoscopy should receive so much attention. The section dealing with the examination of the nervous system is excellent and brings to the student's notice the more recent analyses of disturbances of sensations. In view of the great attention given at the present time to the subject of tuberculous infection, it is a little surprising that the only tuberculin reactions described are those of Calmette and v. Pirquet. A very full index closes a book which deserves as well in the future as it has in the past.

We have already favourably reviewed the second edition of Dr. EMERSON'S *Clinical Diagnosis*,[3] and welcome

[2] *Clinical Methods: A Guide to the Practical Study of Medicine.* By Robert Hutchison, M.D., F.R.C.P., Physician to the London Hospital, and Harry Rainy, M.D., F.R.C.P.Ed., F.R.S.E., Assistant Physician to the Royal Infirmary, Edinburgh. Fifth edition, revised throughout. London, New York, Toronto, Melbourne: Cassell and Co., Limited 1912. (Fcap. 8vo, pp. 666; coloured plates 13, figs. 136. 10s. 6d. net.)

[3] *Clinical Diagnosis.* A Textbook of Clinical Microscopy and Clinical Chemistry, for Medical Students, Laboratory Workers, and Practitioners of Medicine. By Charles Phillips Emerson, A.B., M.D., late Resident Physician, the Johns Hopkins Hospital; Professor of Medicine, Indiana University School of Medicine. Third edition. Philadelphia and London: J. B. Lippincott Company. 1911. (Roy. 8vo, pp. 753; plates 5, figs. 126. 21s. net.)

the third. The author has earned the lasting gratitude of students of medicine, using this term in its broadest sense. Too often laboratory guides give the reader the impression that diagnosis depends upon two entirely different modes of inquiry—the one set aside for the pure clinician, rather old-fashioned if not out of date, the other presided over by the expert technician, to whom is conceded a much lower degree of fallibility. If for no other reason, we should be grateful to Dr. Emerson in that his book, both in its intention and in its accomplishment, succeeds in showing how the two branches of study achieve their greatest success in a reasonable, mutually supporting alliance. When a close inquiry is made into the details of the subject matter—say, for example, that devoted to a study of gastric analysis—it is seen how admirably Dr. Emerson combines the critical and technical excellencies of a pure laboratory worker with the common-sense bedside knowledge of the clinical investigator. Indeed in this section, and in others dealing with such subjects as the examination of the sputum, the urine, the intestinal contents and faeces, the blood and various body fluids, loaded as they are with the most technical details, there are many flashes of clinical generalizations which gain in brilliance by their juxtaposition with the advantages or failures of laboratory investigations. The biological reactions which have loomed so largely of recent years upon the clinical horizon, such as the Wassermann test, are treated in a masterly way, the reader gaining knowledge the while on some of the clinical difficulties which the widespread use of this test has brought to light. It is well for us to note how opsonic observation is apprized by a worker of Dr. Emerson's capacity. "At present the status of the opsonic theory seems unsettled." The illustrations, including some most beautifully executed coloured plates, deserve the highest praise; they contribute towards making this volume one of the best guides we know of written in English, and comparing most favourably with similar works in other languages.

We have much pleasure in noticing the encyclopaedic *Textbook of Medical Diagnosis*,[4] by Professor JAMES M. ANDERS and Adjunct-Professor L. NAPOLEON BOSTON, both of Philadelphia. The most obvious drawback to the book is its great size and weight. It contains 1195 pages of text, with 25 plates, of which 17 are coloured, and 418 other illustrations. Before we pass from this part of our notice we should like to say that although the plates and photographs of pathological conditions are excellent and most instructive, we venture to dissent, as a matter of taste, from the practice now common in American works of medicine of using photographs of naked healthy women for the purpose of demonstrating areas of dullness and the like, which can be quite as well shown upon outline figures. In the preface the authors say that their purpose has been "primarily to furnish an improved method of determining the clinical features of disease," and further on that they have "aimed to present consistently within a single modern textbook the full modern resources of the art and science of medicine as related to medical diagnostics." They think that the new features of their work are the brief pathological definitions of special diseases, the illustrative cases selected from the practice of the authors and the numerous diagnostic tables. The book is well printed and the subject matter set out in paragraphs with headings in thick type, and as a work of reference it will be valuable to practitioners. It is delightful to find the authors insisting so strongly upon the need for a long course of systematic case-taking as an indispensable element in the training of a physician. The habit thus acquired becomes in course of time so settled that the mental equipment persists throughout life, while the knowledge of cases gained is a permanent store of experience upon which to draw. This is so obviously true that many may think it a platitude, but unfortunately teachers know what a large proportion of students look upon case-taking as merely a piece of drudgery which they perform so far as they may be compelled, but without the slightest appreciation of its manifold advantages. In a book which is in most respects so thoroughly up to date it is somewhat surprising to find no reference to electro-cardiography as an aid to the diagnosis of heart disease. We note that Mackenzie is not given credit for the polygraphic method introduced by him, but both instrument and method are attributed to Jaquet; further, in describing the Doremus ureameter, it is said to have been modified by "Hinds," a misprint for Hintz. In the differential diagnosis of heart-pain of an anginal character, it is scarcely sufficient to speak of pseudo-angina as occurring only in hysterical women. The differential diagnosis of these pains is of some complexity, but of great importance, so that the question deserved more thorough treatment. We believe the differential diagnosis of purpura from scurvy and haemophilia is more difficult than the authors allow. The value of inflation of the stomach in the examination of this organ seems to be hardly sufficiently appreciated, but the *x*-ray shadow diagrams of bismuth meals in the diagnosis of stomach intestinal diseases are excellent. The name of the late Dr. Meinert of Dresden is spelt "Mienert." In view of the general acceptance of the classical work of Aschoff and Bacmeister, which appeared three years ago, it is scarcely right to teach that gall stones are always caused by infection of the gall bladder. We note that the authors quote an unfavourable report on the results of Cammidge's reaction, but it does not appear that they have any personal experience of it. We should have thought that an Esbach's tube stood well enough in an ordinary test-tube stand, and did not need the special receptacle which is here honoured by being figured in the text.

[4] *A Textbook of Medical Diagnosis.* By James M. Anders, M.D., Ph.D., LL.D., and L. Napoleon Boston, A.M., M.D. Philadelphia and London: W. B. Saunders and Co. 1911. (Sup. roy. 8vo, pp. 1195; figs. 418, plates 25. 25s. net.)

OCULAR MYOLOGY AND THE TREATMENT OF SQUINT.

Ophthalmic Myology,[5] by Dr. G. C. SAVAGE, is a second edition of an elaborate work on the ocular muscles. The new edition consists of nearly 700 pages and has 84 illustrations. The author has made a lifelong study of the action of the extraocular muscles, and, as he states, he has for twenty years been at this disadvantage—namely, that in his teaching concerning the fundamental principles of ocular rotations he has been altogether opposed to that of Helmholtz. The points on which he differs are clearly set out. Dr. Savage is the great advocate of partial tenotomy for the cure of certain forms of heterophoria, and his method of operating is given, as well as a description of the various ingenious instruments he has suggested for its performance. He has invented numerous optical instruments also for the elucidation of the errors to which the muscular balance of the two eyes is subject. It is impossible in a short notice of so technical a book to discuss the various ideas which might call for criticism. All we need say is that it very fully sets forth the views of one who has given his best years to the study of the intricate problems the subject suggests.

In most of the textbooks mention is made of orthoptic treatment of squint, but in no case are careful and detailed explanations given as to how this treatment should be carried out. Even in books devoted especially to muscular derangements of the eye, organized methods of procedure are not invariably laid down. A book on the subject[6] by MM. TERRIEN and HUBERT therefore fills a real want in ophthalmic literature. It is a small work of 280 pages, printed on good paper in large type, written in clear and easy French. The following line of treatment is laid down: We are told that we must not think of correcting the refractive errors of a child under 3 years of age, but must rely upon instillations of atropine into the fixing eye if the squint be permanent in an eye; in alternating cases atropine may be used alternately in one eye or the other. By this means much may be done to prevent the onset of amblyopia. When the child is a little older an occlusive bandage may be necessary to force the amblyopic eye into use. Most ophthalmologists would consider the opinion of Worth and others to be the better—that it is absolutely essential to correct the refraction at once, and to order spectacles even to the nursing child. With patience an approximate retinoscopy is almost always possible in these very young infants, in fact in many cases

[5] *Ophthalmic Myology: a Systematic Treatise on the Ocular Muscles.* By G. C. Savage, M.D. Nashville, Tenn.: Mcquiddy Printing Company. 1911. (Med. 8vo, pp. 696; figures 84, plates 6.)

[6] *Traitement adjuvant du strabisme.* Par F. Terrien et Hubert. Paris: G. Steinheil. 1912. (Med. 8vo, pp. 292; figs. 137. 4 francs.)

the infant is more easily managed than the spoilt child of 2 years old. Worth's special infant's spectacles are well tolerated, and if there is much refractive error the child actually demands them. When the refractive error is corrected the infant often ceases to squint. This is the sole criticism we have to offer on an excellent book, but it is a most important point, and it is surprising that the able authors, who quote freely from Worth's book, have not appreciated it. They go on to say that having provided the child of 3 with spectacles, the next procedure is to try to combat neutralization—in other words, to evoke diplopia. Neutralization is always present, because squinters do not possess binocular vision. This can be effected by using Rémy's diploscope or Terrien's synoscope, or often with Holmes's or Pigeons's stereoscope. Having got so far, we now try to get simultaneous vision and the fusion of the double images. Normal binocular vision follows in due course, and then exercises must be undertaken to improve and amplify binocular vision. The large diploscope is the instrument which the authors chiefly adopt, and a whole chapter of the book is devoted to describing it. Terrien freely admits that orthoptic treatment generally, in the case of convergent strabismus, ends in failure, and can only be regarded as a useful preparation for an operation, and a valuable means of treatment after such intervention. But divergent strabismus is far more amenable to orthoptic treatment, and the results are excellent. We can cordially recommend this useful book.

DISEASES OF CHILDREN.

THAT a second edition of Dr. STILL'S *Common Disorders and Diseases of Childhood*[7] has been called for within a comparatively short time may be taken as a testimonial to the many merits of the book. Its popularity is no doubt due to the practical character of the information it contains. It needs no very extensive experience of the ailments of children, as met with either in private practice or in the out-patient departments of hospitals, to realize that the author is presenting to us in chapter after chapter pictures of disease drawn from life, and wonderfully true to life. His success in this difficult task is all the more remarkable because he has not confined his descriptions to those ailments which it is easy to depict because of their well-marked features and clear outlines. The titles of some of his most successful lectures, "Abdominal Pains in Children beyond the Age of Infancy," "Fever of Obscure Causation," "Bilious Attacks (so-called) in Children," show that he does not lack the courage to select subjects of considerable obscurity. In the matter of the artificial feeding of infants, Professor Still's views remain distinctly conservative. Although there are many passages which show that he is keenly alive to the danger of excess of sugar in the diet, he still holds to the belief that the commonest difficulty met with is in the digestion of protein, and that for mild cases of "curd dyspepsia" the sodium citrate addition is effectual. We are glad to see that he has nothing to say in favour of whole milk as the routine diet of very young infants. Although he regards the distinction between infective and non-infective diarrhoea as unreliable, he adopts a classification of the symptom diarrhoea under the three headings (1) Gastro-intestinal Catarrh, (2) Gastro-enteritis and Ileo-colitis, (3) Cholera Infantum, and states definitely that in the majority of cases infantile diarrhoea is due to some micro-organism. We should have preferred to have found a more cautious statement, in view of the very slender evidence upon which the theory of the "epidemicity" and "infectivity" of infantile diarrhoea rests. The supposition which at present finds most favour on the Continent, that the increase of diarrhoea in the summer is due to a loss of tolerance for food, the direct result of heat, is dismissed in a sentence, because if such be the cause "the breast-fed should suffer equally with the hand-fed"—a statement which seems to ignore the common experience that diarrhoea in its most severe form most commonly affects the weakly and under-developed. The fact that resistance and the capacity for recovery are greater in breast-fed than in artificially-fed children may explain the infrequency with which they are attacked and the trivial character of the disease when present.

Infant Feeding,[8] by CLIFFORD G. GRULEE, A.M., M.D., is a book which shows how close is the connexion between American and German medicine. In a surprisingly short space of time the work from the laboratories of Berlin, Munich, or Vienna, becomes the subject matter of works published in Chicago or New York. In Dr. Grulee's book the classification of disorders of nutrition proposed by Professor Finkelstein of Berlin is adopted, together with much of his teaching as to the important part played by the carbohydrate constituents of the food in the production of fermentative diarrhoea, and the acid green stools of infants. The reader will find a clear account of the dietetic treatment, as practised in Germany, of eczema, scurvy, and rickets, as well as a description of the symptoms and treatment of Czerny's exudative diathesis, and of the so-called spasmophilic diathesis. To those who have not time or opportunity to become familiar with even a small part of the enormous German literature which exists upon these and kindred subjects, the book should prove extremely useful. Well and clearly written, it is profusely illustrated both by coloured drawings of the stools of infants upon different diets, and by photographs showing the typical appearance of infants suffering from the disorders discussed.

THE MAKING OF NECROPSIES.

IN his book on *Post Mortems and Morbid Anatomy*[9] Dr. SHENNAN, Pathologist to the Royal Infirmary, Edinburgh, gives an account of the Edinburgh pathological teaching as modified by his own practice. The twenty chapters of which the book consists are well arranged, and take the reader through the examination of the body in more or less the same order, part by part, as the *post-mortem* examination is ordinarily made. The book is intended as a practical guide to the medical man or student who is called on to examine a cadaver, and Dr. Shennan devotes most of his pages to the naked-eye appearances and morbid anatomy of the various organs in disease. He gives brief accounts of the bacteriology and microscopy in a few of his chapters, where such additions are helpful. Twenty pages towards the end of the book explain the morbid changes produced by poisons; a few methods of preserving specimens, embedding tissues, and staining or preparing slides, are detailed; and tables for converting imperial into metrical measurements, or vice versa, are added. Dr. Shennan also gives an index of what may be called *post-mortem* literature for the last four years. The illustrations all represent naked-eye appearances; they are almost all reduced from photographs of specimens in the author's or other collections, and in most cases are excellent. In some, however, one cannot help thinking that the reduction in scale—to a third or a quarter of the natural size—has been carried too far, and that the pictures would have gained in clearness and value had it been possible to make them larger. We can cordially recommend Dr. Shennan's book to the attention of students, practitioners and pathologists. It is well and clearly written, the work of a practical man, thorough and complete without being unduly long. The volume is well got up, and has an excellent index.

NOTES ON BOOKS.

THE number of persons who are being led to take an interest in the manifold social problems included under the title of eugenics is steadily increasing. For all such as have had no biological or other technical training, Mr. and Mrs. WHETHAM have published a very useful and instructive little volume entitled *An Introduction to Eugenics*.[10] After giving a short historical sketch of the subject, in which a biographical notice of the late Sir Francis Galton rightly finds place, the authors deal in succeeding chapters

[7] *Common Disorders and Diseases of Childhood.* By G. F. Still, M.A., M.D., F.R.C.P., Professor of Diseases of Children, King's College, London. Second edition. Oxford Medical Publications. London: Henry Frowde and Hodder and Stoughton. (Demy 8vo, pp. 827; figs. 51. 16s. net.)

[8] *Infant Feeding.* By Clifford G. Grulee, M.A., M.D., Assistant Professor of Pediatrics at Rush Medical College. Philadelphia and London: W. B. Saunders and Co. 1912. (Pp. 295. 13s.)

[9] *Post Mortems and Morbid Anatomy.* By Theodore Shennan, M.D., F.R.C.S.Edin. London: Constable and Co. 1912. (Med. 8vo, pp. 511; plates 3, figs. 207. 18s. net.)

[10] *An Introduction to Eugenics.* By W. C. D. Whetham and C. D. Whetham. Cambridge: Bowes and Bowes; London: Macmillan and Co., Ltd.; Glasgow: James Maclehose and Sons. 1912. (Demy 8vo, pp. 74. 1s. net.)

with such subjects as racial qualities, methods of research, and the construction of society. The authors are well known by their writings on this subject, and their book forms an admirable introduction to the subject, and should be very helpful in educating the public in the vital importance to the community of a right understanding of the problems involved. It seems useless to expect Parliament to deal with these matters until there is a strong force of public opinion to urge it to take action, and it is only by pioneer work of this kind that the necessary stimulus can ever be attained. There appears to be a danger of eugenics becoming "fashionable." Medical men can do more than any other class of persons to keep it on the right lines, and to all those who have not already turned their attention to these matters, this volume may be commended.

Among the various possibilities of professional evolution in the near future inevitably suggested by the present crisis two stand out above the rest as clearly defined alternatives, and the free or constrained choice between them must largely govern the issue. On the one hand, Medicine may retain its economic independence and, with that, its autonomy in regard to the regulation of its activities—we may set its own house in order; on the other hand, the State may intervene, assuming the responsibility of providing for all citizens efficient medical attendance, and, as a natural corollary, that of paying the salaries of its official practitioners. We have received from Dr. ARTHUR TODD-WHITE a pamphlet entitled *S. M. S.: A State Medical Service*,[11] wherein he wholeheartedly advocates the second of these alternatives, pointing out that the thin edge of the wedge has already been inserted by the Insurance Act, and insisting that some such full-blown socialistic régime as he outlines is bound to follow. This argument hardly carries conviction at a moment when the Government seems to have renounced the attempt to provide medical benefits otherwise than in the form of a meagre pecuniary dole; nevertheless, the main features of Dr. Todd-White's forecast will doubtless be of interest to many. His higher officials of his State Medical Service are to be paid by the Treasury, the rank and file out of a rate specially levied by each county council. At the head of the service is to be a Minister of Public Health with a salary of £5,000 a year, and by him all appointments are to be made. Members of his council are to receive £1,500; consultants £2,500; the medical officers of districts and subdistricts, who will replace the private practitioner, £500 and £350 respectively; and assistant medical officers £250 per annum. Midwifery and operations are to be "extras," and there is to be "free choice of doctors" for the patients, subject to the condition that the number of patients assigned to each medical officer is to be limited. All members of the service are to have periodical opportunities of attending a three to six months' course of hospital study; definite "times off" and holidays are to be provided for by means of a special staff of "locums," and country members are to receive motor or horse allowance. Last, but by no means least, the medical civil servant is to share the privileges of his lay predecessors; after not less than thirty years of faithful service he is to be retired at 60 with a pension equal to one-third of his salary. We note with satisfaction that such a service would, in the author's opinion, provide work for all existing practitioners, "and many more," but the grounds for this conclusion are not stated.

Dr. V. E. HENDERSON'S *Textbook of Materia Medica and Pharmacy*[12] is intended for the use of medical students, and was originally written to meet the needs of the author's classes in the University of Toronto. It deals only with the subjects named in the title, and does not touch on therapeutics or pharmacology as some textbooks of materia medica do. The matter is presented in a condensed form. The relative importance of drugs is indicated by differences in the type used for their names, and small numbers are employed to show the greater or less importance of their preparations. Matter deemed superfluous has been rejected with judgement, and the book is very suitable for use as an adjunct to class instruction and for purposes of revision.

Readers of Mr. STEPHEN ANDREW'S much discussed novel, *Dr. Grey*, will doubtless remember the doctor hero's socialistic friend, the journalist Rufus O'Brien. In his new book, *Sable and Motley*,[13] which in some respects may be regarded as a sequel to the former, Mr. Andrew has given us the love story of that creedless Irishman with the daughter of a Church of England clergyman, whose wife is honestly convinced that no one can find salvation outside the pale of the Church. The inevitable conflict between the man of wide charity and no creed and the narrow Christianity of the hard-working, upright, and withal intensely unsympathetic woman is finely portrayed, as is the attitude of the peace-loving vicar, her husband, vainly endeavouring to mediate between progressive youth and stationary maturity. The unhappy mother, torn between her love for her daughter and her loyalty to her Church, is a tragic figure; but the gloom of the story is considerably relieved by a wonderfully vivid picture of a general election, with its accompanying intrigues, in an English manufacturing town. For that alone the book is well worth reading, whilst the occasional descriptions of slum life should provide food for thought for that large class of philanthropists which seems to regard the poorer classes as a convenient safety valve for their superfluous energy. Like the immortal Æsop, Mr. Andrew presents his moral in the form of a fable; but it is none the less plain for those who desire to see.

[11] Printed by Alex. Lamb, High Road and Hainault Road, Leyton.

[12] *A Textbook of Materia Medica and Pharmacy for Medical Students.* By V. E. Henderson, M.A., M.B. Toronto: University Press. 1912. (Med. 8vo, pp. 140.)

[13] *Sable and Motley.* By Stephen Andrew. Published by Greening and Co., Ltd., 91, St. Martin's Lane, London, W.C. 1912. (Pp. 316. Price 6s. net.)

MEDICAL AND SURGICAL APPLIANCES.

Test-Types for Young Children and Illiterates.

DR. H. BEALE COLLINS, D.P.H. (Kingston-on-Thames), has arranged the "common object" test-types shown on a reduced scale in the diagram to correspond as nearly as possible with the letters of Snellen's types—$\frac{6}{6}$, $\frac{6}{9}$, $\frac{6}{12}$, etc. Dr. Collins writes: The limbs and minor characteristics of animals and parts of common objects cannot always be of the same relative size as the limbs of letters are in their scientific arrangements for Snellen's types. The trunk of the elephant, or the antennae of insects, must, in order to strike the eye by their similitude, be shown of a relatively larger size as compared with the bulk of the animal or insect. The body being compared to the thicker parts of the letter and the legs to the thinner parts, it is evident that in true proportions the trunk of the elephant, antennae, etc., or similar distinctive marks of an animal would be on too small a scale to be visible at the distance at which the grosser parts would be clearly seen. These grosser parts would be unrecognizable without the smaller characteristics, so each figure has been drawn of such a size that it may be recognized as a whole by a person with normal vision at the distance for which it is marked for use. A standard letter, or letters, is given on each line as a comparison, and it will be noticed that this is often very much smaller than the common object, but for ordinary sight it will be found to be just as clearly defined at the marked distance. It is not contended that these types can in any way supersede the use of Snellen's types, nor that when the figure is distinguished at the distance marked anything more than an approximate appreciation of the acuity of vision can be ascertained. It is of great importance in some cases to gauge the vision of young children before they know their letters. Other children decline to recognize letters who would be proud to show their acquaintance with animals and other objects of interest. The types may also be useful for persons of weak intellect, or for natives unacquainted with the Latin letters. The cards are to be obtained of Messrs. F. Davidson and Co., Great Portland Street, W.

MEDICAL EDUCATION IN EUROPE.

Two years ago the Carnegie Foundation for the Advancement of Teaching published in their Bulletin No. 4 a valuable report on medical education in the United States and Canada, by Professor Abraham Flexner, with an introduction by Professor Henry S. Pritchett, President of the Foundation, and this has now been supplemented by a report on medical education in Europe by the same authors.* This Bulletin No. 6, as it is called, is of the greatest value to all interested in medical education, and we commend its careful study not only to every member of the General Medical Council but to every teacher in our medical schools. The plan of the report is, after the introduction, a historical chapter, and one giving the number and distribution of medical practitioners in the countries considered, to describe the teaching as it is based, first, upon general education; secondly, on the preliminary sciences; the report then discusses the teaching of the special medical sciences, anatomy, physiology, and pathology, in the three countries; finally, clinical instruction, the curriculum, and the examinations. Later chapters deal with the financial aspects of medical education, with sects and quacks, post-graduate instruction, and the medical education of women. An appendix gives statistical tables of the cost of medical education in the universities of Prussia and Bavaria.

Those who have read Bulletin No. 4 will not be surprised in the introduction to the present volume to find the statement that if the lowest terms upon which a medical school can exist abroad were applied to the United States, three-fourths of its existing schools would be closed at once. The writer realizes that in America, and even to some extent in England, medical education is weakened by the unnecessary multiplication of medical schools, and he says:

> There is no opportunity to-day, either in England or America, for a wiser use of money if judiciously expended than in supporting on the right foundations the comparatively small number of medical schools needed in each country to train men to do the work of the profession. There is no field of human endeavour in which a wise Government can do more for civilization than in this cause. The man who has intelligently thought out the place of physician in our social world, or who realizes the enormous service which medicine is now rendering and is to render in the future, not alone in the cure of disease, but in its prevention, will rise to his responsibility. It will be a source of hindrance to the work of civilization in the United States and England if there cannot be found those who will avail themselves of this great opportunity.

In the United States the production of doctors is largely in excess, there being 1 to 568 of the population, as compared with in England 1 to 1,107, in Germany 1 to 1,912, and in France 1 to 2,000. The report seems to assume that the German and French standard of 1 to 2,000 is sufficient, but we think this may be doubted, and that if it is tolerated in those countries it is because a large part of the population, especially in the country districts, regards the services of a doctor in ordinary illness as an unnecessary luxury and expense; but the difference between the two standards is so great that it may be readily admitted there is good ground for believing that the annual output of medical practitioners in the United States might be reduced by two-thirds with benefit to the medical profession and without any injury to the public interest.

Passing on to the educational questions, the writer of the report sees clearly the superiority of the German system, which requires in all cases evidence of sound general education before the student enters upon his professional studies. In this respect both France and Germany are in a more satisfactory condition than England, where the varying examinations accepted by the different licensing bodies and the low standard of the lowest of these, which necessarily determines the general level, lead to the entrance into the medical schools of a number of ill-educated youths who are unable to take advantage of the education provided for them, with results which are seen in the undue prolongation of the medical curriculum, and the high percentage of failures at the qualifying examinations. These ill-trained students, moreover, being unable to teach themselves, demand an amount of tutorial instruction which is a burden upon the school, and the effect is at the best merely to enable them to scrape through their examinations without any adequate educational result. This and perhaps the excessive amount of time devoted to athletics are the chief defects pointed out in our British system of medical education. In Germany the writer notes the deficiency in the supply of anatomical subjects, and the corresponding excess of lecturing in anatomical teaching. Physiology also is said to be badly taught in Germany, as, owing to inadequate appliances, the student is not allowed to do things for himself. It is satisfactory to note that in both these particulars the methods of teaching in British schools meet with approval. Again, the authors rightly see that the teaching of medicine and surgery can be satisfactory only where the student is brought into actual contact with the cases, as he is by our system of clinical clerkships and dresserships, where the student is responsible for the case, and follows it to the end. No lecturing, however carefully performed, can take the place of this, even although the patient is there to be looked at and microscope slides and test tubes are handed round. The system in Germany by which the so-called "Praktikant" is called into the arena to examine the patient is considered to be a failure. Few answer to their names, still fewer seem capable of examining the cases, and after one or two timid attempts stand aside and allow the professor to proceed with his demonstration. "The professor does everything; it is a futile device." Nor is the "famulus" much better; it suggests the English clinical clerk, but is "inferior to the English analogue in authority of service, universality of custom and definiteness of responsibility," while not 50 per cent. of the students ever hold this post. The insertion of a hospital year between the university and professional practice has been introduced in Germany as a means of supplementing the deficiency in practical training, but, in the opinion of the author, has yielded disappointing results, partly owing to the students' want of training, the absence of any definite functions allotted to them, and also by the action of some hospital managers who have used them to do the work of assistants for which they are not fitted. Finally, two-thirds of this so-called hospital year may be spent in laboratory work. Practical midwifery seems also to suffer in Germany in the same way, the number of labours which the student must attend being only four. On the other hand, the reporter points out plainly the shortcomings of our British system. "The spoon-feeding of the student, the concentration of responsibility for a mechanically adequate equipment upon the tutors, are undoubtedly important factors in bringing about the general sterility of English medicine; for the ideal constantly held up is schoolboy mastery of the known."

Considerations of space forbid our dealing with many interesting subjects in this report, but we must say a word or two about the examinations. There are many who look on the State examination in Germany as maintaining a uniformly high standard of qualification, but this report is by no means entirely favourable to the system. We are told that "the details and specifications of the State are none too scrupulously obeyed" and are not, as a matter of fact, enforceable; that the examinations as conducted are hurried and crowded, and that haste leads to laxity; that the practical tests cannot be stringently or thoroughly applied; and that cramming flourishes. The State examinations are said to be less practical and more theoretical than the regulations design, that they bear no uniform or consistent character, and vary greatly with the individual. "A brilliant young Berliner admitted that he had shirked practical surgery, obstetrics, and gynaecology without consequences to his examination," while although students are undoubtedly often rejected in this subject or in that, occasionally a second time, "on the third trial they always pass." "At the critical moment, when an incompetent could be cut off, the barrier is lowered and he is invariably allowed to get over." On the other hand, the reporter believes that the General Medical Council in this country "has not been unsuccessful in maintaining the definite minimum, which is perhaps all that the one-portal system contemplates," and the latter would make "less educational difference than is expected, unless its establishment coincided with the modification of the national predi-

* *Medical Education in Europe.* A Report to the Carnegie Foundation for the Advancement of Teaching. By Abraham Flexner. Introduction by Henry S. Pritchett, President of the Foundation. Bulletin No. 6. New York. 1912.

lection for examining and getting examined." In fact, the reporter's main objection to our British system is that we rely too much on examinations—our hospital appointments, for example, being reserved for men who have obtained what are called higher qualifications, which are given on an examination test of knowledge rather than for productive individual performances; that is to say, he would like to see the Membership of the College of Physicians and the Fellowship of the College of Surgeons given not for attainments in book knowledge, but for research work—a conclusion which seems to be quite in accordance with modern ideas, and might well be taken into consideration by the bodies concerned. The author recognizes the dilemma about examiners, for while the examination of students by their own teachers is not altogether satisfactory, an examination by outsiders alone is even more objectionable, and he thinks the British solution a decidedly happy one. "The profession governs itself, the examinations represent its pride in its own dignity and competence." They "demonstrate the feasibility of examining large numbers by the combined action of teachers and practitioners," while "arrangements are admirable," "partiality is eliminated," the "tests are increasingly practical," "evasion and vagueness get short shrift," and the "bearing of the examiners is informal, sympathetic, and easy." That the examinations have defects is not denied, but fortunately these "do not affect their fundamental merits."

The defects pointed out in British medical education are those of which the profession is fully aware. We suffer from defective preliminary education of the medical student, which interferes seriously with the teaching of the preliminary sciences, and in some places the equipment and arrangements for the teaching of these sciences are certainly not ideal; the system leans too much upon examinations, and tends to encourage cramming, to which the schools lend themselves by compelling their junior members to devote a large part of their time to tutorial instruction; there are too many systematic lectures in the practical classes, and there is no encouragement for research as the means of obtaining the professional prizes of hospital appointments. But while these defects are pointed out, the report shows that in no other country is the medical student made to do so much for himself, brought so closely into relation with the sick, or compelled to pass such a practical examination before receiving his qualification to practise.

REPORT OF THE METROPOLITAN ASYLUMS BOARD.*

THE Metropolitan Asylums Board, established in 1867, consists of fifty-five members elected by the metropolitan boards of guardians and eighteen members nominated by the Local Government Board. The area of administration of the Board includes all the unions and parishes in London, and it deals with those matters which it is considered can best be transacted by a central authority for the whole of the metropolis rather than by each separate board of guardians acting locally. The duties of the Board include the task of providing for the accommodation and treatment of infectious diseases arising in the metropolis and the incidental ambulance service necessary; provision for the care of the mentally defective who are not certified as lunatics; the care of various classes of Poor Law children, and, since November, 1911, the care of the casual poor in London.

The report of the Board for 1911 is of more than ordinary interest, for the reason that during that period measles and whooping-cough were for the first time treated in the infectious diseases hospitals; the casual poor also for the first time came under the care of the Board; and, lastly, a complete scheme was adopted for the systematic classification and treatment of the whole of the mentally defective persons of whatever grade for whose care the Board is responsible.

Infectious Diseases.

The number of patients admitted for treatment in the hospitals of the Board during the year was 21,138, an increase of 5,900 over that of 1910. This increase is mainly accounted for by an additional 1,500 diphtheria patients and by the measles and whooping-cough cases. Of the scarlet fever cases notified during 1911, as many as 89 per cent. were admitted to hospital, of diphtheria 85 per cent., of typhoid fever 51 per cent., and of small-pox 99 per cent. This is a considerable improvement over the early years of notification, for in 1890 the percentage of scarlet fever admissions was 43, of diphtheria 18, of typhoid fever 23, and of small-pox 37. The mortality per cent. in the case of scarlet fever was 1.9, diphtheria 8.9, bacteriological diphtheria 2, typhoid fever 14.3, measles 13.9, whooping-cough 13.2, and small-pox 15.7. Separate receiving-rooms for measles have now been provided at all the hospitals. The treatment of measles and whooping-cough has been sufficiently successful to justify the conclusion that these diseases have established a claim upon a portion of the hospital accommodation, and a scheme has been settled by which in the event of a well-marked seasonal rise in the numbers of scarlet fever and diphtheria patients a certain number of beds can be reserved for measles and whooping-cough if required for those diseases.

The substitution of motor for horse traction at the ambulance stations is now practically completed.

Mental Defectives.

Although the "insane" were included amongst the classes of poor for whose reception and relief the Board was formed in 1867, the persons to be admitted into the Board's imbecile asylums were defined in 1875 as such harmless persons of the chronic and imbecile class as could be lawfully detained in the workhouse. In 1897 feeble-minded children were included amongst the classes of poor persons to be received by the Board, and authority was subsequently given for their detention after 16 years of age. At the end of 1911 an Order of the Local Government Board defined the mentally defective persons to be received as

> persons not certified as lunatics, who, by reason of mental defect, are incapable of receiving proper benefit from ordinary instruction, or cannot be properly trained in association with other persons in ordinary schools or institutions, or are incapable of using ordinary means or precautions for protecting themselves from injury or improper usage or treatment, or are incapable of maintaining themselves by work; provided that any such poor person on admission into an asylum belonging to the Metropolitan Asylum Managers shall not exceed 21 years of age.

During 1911 a complete classification of all the mental defectives under the care of the Board was undertaken. The Darenth Asylum was turned into an industrial colony for the highest grades of mental defectives, who were properly classified, and the unimprovable imbeciles were sent temporarily to the Fountain Hospital, Tooting Grove.

Children.

In addition to children who are mentally defective, the Board is responsible for the care of Poor Law children who are sick, debilitated, or convalescent, who are suffering from contagious disease of the skin or scalp, from ophthalmia or other contagious disease of the eye, and those who are physically defective. These children are provided for in two hospitals for sick children, three sanatoriums or homes at the seaside, two ophthalmia schools, and one ringworm school.

The Casual Poor.

It has been clear for some years that there has been a lack of uniformity of administration in connexion with the treatment of the casual poor, and in 1911 definite steps were taken to secure greater uniformity so far as the metropolis was concerned. By an Order of the Local Government Board the metropolitan casual wards were transferred from the boards of guardians to the Metropolitan Asylums Board. It was anticipated that the Board would be able to make more adequate arrangements than had hitherto been practicable to inform the police of the wards in which there was a vacant accommodation, and thus ensure destitute wanderers and wayfarers the provision of the food and shelter of which they might be in need. It was hoped, moreover, to differentiate the occasional from the habitual vagrant, and to assist the former in securing employment.

* Metropolitan Asylums Board: Annual Report for the year 1911 (fourteenth year of issue). London: Ben Johnson and Co., Limited. 1912 (Pp. 258. 5s.)

Medical Supplement.

The medical supplement is edited, as in former years, by Dr. E. W. Goodall and Dr. F. M. Turner, who continue the information given in previous reports relating to the incidence of complications among the patients treated, post-scarlatinal diphtheria, antitoxin treatment, tracheotomy and intubation and laparotomy. Dr. Turner contributes a report on one year's experience of Dr. Milne's inunction treatment of scarlet fever, and Dr. A. F. Cameron reports on the treatment of scarlet fever on aseptic lines. In an instructive contribution to the medical supplement on the blood pressure in scarlet fever, Dr. J. D. Rolleston expresses the opinion that sphygmomanometry in scarlet fever, as in most of the other acute diseases, is of little practical importance in the acute stage, but in convalescence may give some indication of the severity of the renal lesion, which may be of value in the subsequent treatment of the patient.

BRITISH HOSPITALS ASSOCIATION.

The third annual conference of the British Hospitals Association was held at Birmingham on September 20th and 21st, under the presidency of Mr. J. B. Clarke, Chairman of the Board of Management of the Birmingham General Hospital.

The Lord Mayor, in welcoming the delegates, said Birmingham spent a great deal of money locally through the Health Committee, and a good part of it, £50,000 or £60,000 per annum, was spent in the maintenance of their different civic hospitals. Municipalities were more and more taking into their charge the public health of the city. To him this was all tending to the time when the communities would take entire charge of the public treatment of the sick. He thought the tendency was more and more to take hold of the hospitals. While it would ever be in the power of those who had the means to have private treatment of their illnesses, yet he thought as a rule it would be very soon brought about that the State would take—either by national means or, as he would prefer, by municipal agencies—the charge of all the hospitals. The national insurance against sickness was a step in the same direction. What action the hospitals would take he supposed they could not say until they knew what particular policy the doctors would adopt. He was not going into that matter except to say that he wished the Government would realize that they had a very strong public opinion in the direction of doctors being well paid. They did not want strict calculations made as to what was the lowest sum that would be a living wage for the well-educated doctor. He thought it would be to the advantage of every one that if the State took over nearly all the services of the medical profession, it should so remunerate that profession as to attract the most skilful men in the country. No money could be better spent than in improving the general health of the community.

Hospitals and the State.

A paper by Sir William Collins on this subject was read by Mr. Conrad Thies, in which he said that more than at any other time within living memory, the fundamental question of voluntaryism or communism in the matter of hospitals was engrossing the consideration of all thoughtful reformers. From two other sides had the Legislature led up to what almost amounted to an assault upon the voluntary hospitals as they had been known for the last two or three generations. A brief study of what was going on in regard to medical inspection and treatment of school children under the vague and casual powers of the Act of 1907 brought them up against the whole problem of the future of voluntary hospitals. The other direction from which recent legislative action would lead up to a review, if not a revision, of the voluntary hospital system, was the National Insurance Act. It was not easy to forecast the influence of this Act upon the hospitals. An attempt was made last year by the King's Hospital Fund, based on such materials as were available, to forecast the probable results. From this it appeared that the number of in-patients would not improbably be increased, by reason of the more systematic medical observation of the industrial population, even though the number of tuberculous cases admitted to hospital might eventually be reduced. Out-patients, on the other hand, might tend to be of a different class from those hitherto dealt with, and might not improbably be reduced in numbers. There appeared to be widespread apprehensions that contributions to hospitals, alike from employers and employed, would be reduced. He ventured to point out when the bill was introduced, and when on all sides there were expressions of approval of its amiable principles, that almost every detail raised a principle, and that a rather radical imperfection was embodied in the claim that the bill would provide all insured persons with full medical and surgical treatment, whereas the only means for supplying such benefits, in other than tuberculous cases, was to be by way of arrangement of Insurance Committees with individual general practitioners. The fact that the services of the hospitals were largely resorted to by general practitioners for persons of the insured or insurable class was either ignored, or it was tacitly assumed that they would be relied on in the future to discharge such benefits to the community, possibly even in a greater degree than before. The recent announcement that the antituberculosis crusade was to be a national one, and not confined to insured persons under the Act or their dependents, would doubtless raise, in a similar way to the treatment of school children and of insured persons, the rôle, if any, which the voluntary hospitals were to play. If the arrangements set up by public funds were outside the work of the hospitals, an artificial severance of tuberculous disease in its protean manifestations would result in much duplication of machinery both clinical and pathological. If a contribution per capita was to be made to hospitals in respect of insured persons treated therein, in view of the fact that a portion, at any rate, of such contribution came from the pocket of the insured, the compulsory contribution would reciprocally give rise to assertion of rights and the refusal to be used as "clinical material." Under a voluntary system such assertion was absent. As regarded the hospital staff, he supposed it was generally agreed that under a State or municipal service the visiting medical officers could not, or would not, any longer perform their duties in an honorary capacity. Whether the same class or type of visiting physicians and surgeons would be secured under a salaried system, controlled by a publicly appointed committee, was to say the least problematical. It had been estimated that if the hundred odd voluntary hospitals of London were put on the rates and staffed and managed after the fashion, say, of the Metropolitan Asylums Board institutions, it would mean a new charge of something like 8d. in the £ on the rates. Difficulty, however, would always be met with in dealing with (1) the urgent cases, which must be admitted irrespective of poverty, and (2) interesting clinical cases or cases of doubtful diagnosis, which would be franked or demand elaborate equipment which the general practitioner could not be expected to supply. This question of the abuse of out-patient departments, however, sank into relative insignificance beside that of voluntaryism or a State system for treatment of the sick and injured. Recent legislation had brought that question into the foreground. Was it to be answered by the application of principles or by mere eclecticism or empiricism? Was the presumption to be in favour of the State or of those charities remaining in private hands? The care and control of infectious disease and of lunacy requiring restraint, were clearly distinct from other cases of illness and cases of accident; State intervention in such cases might be justified on principles of which individualists would not disapprove. But, in other cases, a State system was beset with many difficulties. He would put in a plea to the effect that good voluntary work such as that which had been successfully organized in this country in the case of the general and special hospitals, which had supplied a felt want, had won the confidence of the public, inspired disinterested professional service among the most capable of the profession, and kept the healing of the sick from being impersonalized and stereotyped into routine and officialdom, should not be lightly thrown away through a mere careless acquiescence in a communistic trend.

Work and Training of a Hospital Almoner.

A paper on this subject was read by Mr. EDGAR S. KEMP (Secretary, Hospital Almoners' Council). He said the almoner was in the hospital as a reminder that doctors and social workers, hospitals and charitable societies, could only do their best work in combination. The first step would be to ascertain the suitability of the patient for treatment at the hospital. With regard to the grounds of the decision as to the suitability of a patient, whether any wage-limit could be fixed, and so on, he thought it was quite impossible to lay down any hard and fast rule. Particular rules might be laid down for particular classes when circumstances were normal, but the general principle must always be that each case must be judged on its merits. When it was decided that the patient might properly be treated at the hospital, it remained for the almoner to see that the treatment was effectively carried out and that the patient was benefiting by it to the full. The most important factor in this matter was the patient himself, who might not be disposed to follow the doctor's advice as to his mode of life—he might not be able to do so; his home conditions might be bad, his work might be unsuitable—all these were matters with which the almoner must deal. It might be thought that the mere provision of convalescent treatment or a surgical instrument would be a simple matter to an almoner accustomed to secure the co-operation of charities outside the hospital. That was true, but it did not necessarily follow that the matter was ended there; instruments must be worn regularly and must be properly looked after. Similarly, convalescent treatment might not be the only remedy required. In many cases no material help was required; advice only would bring about the desired effect. This advice must often be followed up by friendly visiting, which might have to be continued for a prolonged period. The quality which the almoner most needed was tact, not only that she might deal sympathetically and wisely with the patients, but that she might remain on good terms with the secretary, the governing body, and the medical staff of the hospital, as well as with all those others outside the hospital on whom the success of her work so much depended. The Hospital Almoners' Council, therefore, selected with the greatest care candidates to be trained for almoners' posts. The Council owed its initiation to Mr. C. S. Loch, of the Charity Organization Society. The Council started work experimentally as an independent body in November, 1907, and since that date had trained and given certificates to twenty-one almoners, who were now working in London and the provinces. The Council now numbered about fifty members, including representatives of the governing bodies and medical staffs of many of the London hospitals. Arrangements had recently been made to supply part of the training, in certain cases, in Leeds, where almoners trained by the Council were working. It was hoped later to extend this arrangement to other cities. The future of the movement was, he thought, assured; the recognition by the special committee of King Edward's Hospital Fund of the value of the system was a striking tribute to the devoted work of those almoners who had paved the way to a better order and a higher standard of treatment in hospitals. It remained for the hospitals to realize that just as they would not permit an unqualified medical man to deal with the ills of the body, so they could not allow an untrained person to tackle the no less important troubles and difficulties of the patients' lives.

The Insurance Act and Voluntary Hospitals.

Dr. NATHAN RAW read a paper in which he said his experience in the administration of hospitals during the last twenty years had profoundly impressed him with the fact that a great change in their hospital system was inevitable. The work had become too onerous, and the number of persons who were now anxiously clamouring for hospital treatment was so enormous, that it was impossible to find the money requisite adequately to treat this army of sick people. The whole undertaking must be worked on sound business lines, and the treatment of disease must be conducted in the same way as any other municipal enterprise. Another point which had always impressed him was the inequality of treatment under the present system. Those fortunate enough to gain admission to a voluntary hospital received all necessary treatment without any question being asked as to payment, whilst those (in the same class of society) who were taken to Poor Law institutions were carefully scrutinized and made to pay, if possible, the full cost of their maintenance. Of the two systems the treatment under the Poor Law was undoubtedly the more equitable, and experience had shown that even the poor made no objection to pay for treatment. The Insurance Act would undoubtedly hasten on some such scheme with regard to voluntary hospitals. Under the Insurance Act two outstanding facts were before them: (1) No provision was made for the hospital treatment of insured persons; (2) no insured person might be treated by the Poor Law authorities. He estimated that when the Insurance Act was in full swing 30,000 beds would be required to deal with the illnesses of 15,000,00 insured persons. It was a grave defect of the Act that a carefully considered plan had not been prepared when it was framed; but perhaps this defect was only of a temporary character, and when the medical benefits were brought into force a proper arrangement would be made for hospital treatment. Undoubtedly more beds would be required in hospitals than were at present at the disposal of the working classes. In his opinion, in the course of a few years, when the funds had accumulated, the Insurance Committees would provide their own hospitals for the sole use of insured persons, with a properly paid professional staff, on the lines on which many of the German hospitals were conducted, and which worked so smoothly. He sincerely hoped the voluntary hospitals would all be prepared to offer treatment to insured persons on terms to be arranged, and so obviate the necessity of special hospitals.

Dr. T. BASIL RHODES (Secretary and House Governor, North Staffordshire Infirmary) in a paper on the same subject, said he did not propose to spend much time on the question how the National Insurance Act would affect the finances of the hospitals; but he was not convinced that great permanent loss of subscriptions would take place as a result of it. It was quite true that at this moment there was a very considerable tendency on the part of both private subscribers and working-class subscribers to withdraw their subscriptions, but he could not help feeling that the loss of income to the hospitals from voluntary subscriptions could be reduced to a small amount even now, and that, on the contrary, the income might actually be raised to a very large and satisfactory amount in the near future if, instead of anticipating loss of income, the hospital authorities throughout the country would make an urgent effort, of a nature varying in different districts according to the particular conditions, to educate the public in the necessity for the existence of the hospitals and the advantages of the continuance of the voluntary system. The voluntary subscriptions might be considered as coming chiefly from two sources: A. From the private subscribers, who might be subdivided into (1) the private individual who gave from his own private funds, and (2) the employer of labour, as such, who subscribed as the head of a firm or establishment. B. From the working men and women. Referring first to Class A, Subsection 1, he felt sure there would always be a very large number of individuals throughout the country who would, from one reason or another, continue to give help to the hospitals as long as the voluntary system remained. The employer would also give, he believed, in a large number of cases from the same reasons that led the private individual to subscribe; but there was a further motive. It appeared to him that it could be shown to such employers that the hospitals were an absolute necessity, and were of considerable advantage to themselves for many reasons, not the least of which was that a case of accident might be treated at once in the most scientific manner possible, thus in many cases reducing the length of time during which payment under the Workmen's Compensation Act would have to be made. The employer would also very quickly realize that if the hospital which he had hitherto supported was placed on the rates or under the State, the contribution which he would be called upon to make would in all probability be much greater than the subscription which he now voluntarily paid. With regard to the working class subscribers, it was more difficult to judge, because so many forces were at work to influence them in bulk, and one could not be sure

that they would act as a body in the way in which he had little doubt they would act as individuals. There was another way in which the National Insurance Act might most grievously affect the voluntary system of hospitals, and that was in the relation of the hospitals to the medical profession. Taking first the "sanatorium benefit," the medical profession had decided that they would, under certain conditions, carry out this portion of the Act. It followed that cases of tuberculosis requiring such treatment as could only be suitably obtained in a general hospital would have to be sent into such a hospital. There seemed to be two courses open to the honorary medical staff of the hospital in regard to such cases: (*a*) They might decide to treat them as at present—without payment; or (*b*) demand a fee in respect of each patient treated. (*a*) If no payment was asked for by the medical staff in respect of these patients, then the situation as between the hospitals and the medical staff remained unchanged as far as that portion of the Act was concerned; but he thought it very unlikely that in those circumstances the medical staff would wish the hospital to receive payment from the State in respect of those cases. (*b*) If payment was asked for by the medical staff in respect of these "tuberculosis" patients, then it would follow that in each hospital a certain number of beds must be definitely allocated to cases of tuberculosis, and a definite charge made under the Insurance Act for each patient treated therein, and a definite payment (the amount of which would presumably be settled by the medical profession) would have to be made to the medical men in respect of each case. It seemed to him that from the moment any payment whatever was made in respect of patients treated in hospital to a member of the honorary medical staff, he ceased from that moment to be an honorary officer of that hospital. Further than this, it seemed to him that in a district where the members of the honorary medical staff were also general practitioners, the other general practitioners in the district who were not upon the staff of the hospital would be likely to insist that those beds allocated to cases of tuberculosis should be thrown open to all the medical practitioners in the district. With regard to the question of "medical benefits"—the second portion of the Act, which was to be in working after January 15th, 1913—it was impossible as yet to judge what the relation of the medical profession to the hospital would be, but he would presume for the purpose of discussion that some agreement would be come to between the medical profession and the Government, so that the "medical benefits" portion of the Act would be administered. Presuming, then, that the Act was to be in full working order in January next, with the full agreement of the medical profession, it would, he thought, be unfair to expect the honorary medical officers at any voluntary hospital to treat free of charge persons insured under the Act, whose medical attendance was already paid for by means of a capitation grant payable to the doctor chosen from the panel. It had, therefore, been said that the hospitals must at once announce that they would not treat persons insured under the Act either as in-patients or out-patients, except in cases of emergency. To take this step seemed to him both unnecessary and suicidal. Suicidal, because he felt convinced that the subscriptions from the working men would cease at once as a result; unnecessary, because he thought that the medical profession and the hospitals' committees working together in agreement could quite well make such arrangements as would allow of the treatment in hospitals of "insured" persons under certain agreed-upon conditions. Two main factors must be considered by those who desired to preserve the voluntary system of hospitals: (*a*) The relationship of the medical profession to the hospitals; (*b*) the effect of the National Insurance Act upon the annual income of the hospitals. In regard to (*a*)—which seemed to him the factor which would have most immediate effect—he had endeavoured to suggest a scheme which, after consideration by the medical profession and the committees of hospitals, might be successful in preserving the present excellent arrangement, which was probably the best for the patients, for the hospitals, and for the medical profession. In regard to (*b*) he submitted a suggestion which, if adopted by the hospitals and acted upon by the State, would, in his opinion, postpone for some considerable time the necessity on the part of the State to find the enormous sums that would be required for the maintenance of the general hospitals of the country, and would retain for the voluntary subscribers the general control and management of the hospitals which they support. The suggestion was that *at the end* of the financial year each hospital should be submitted to an examination by an inspector appointed by the State on the following points:

1. Has there been during the past year any expenditure which was markedly needless or avoidable?
2. Has sufficient effort been made by the management to retain or increase the voluntary subscriptions?
3. Having regard to the condition of the buildings when the National Insurance Act came into force, does the condition of those buildings show that suitable efforts have been made to set them in proper condition or maintain them in such condition?
4. Is the number of beds available in the hospital adequate for the general requirements of the district served?

It would perhaps be necessary to add further points upon which examination should be made, but it was not necessary to go into details at that moment.

Provided that the report of the inspector was satisfactory the hospital should be entitled to receive from the State *the exact sum of money by which the expenditure for the year had exceeded the income for that year.* It could not, he thought, be argued that a payment from the State under circumstances such as the above was a payment for particular patients treated under the Insurance Act.

Mr. THIES, in opening the discussion, said the support given by the working classes to provincial hospitals had been on a large scale and was very admirable, but in London it was entirely different. There the contributions were so small as to be scarcely worth consideration. In nearly every other country in the world the community had taken upon itself to provide adequately for the sick. He thought that in this country eventually they would have a scheme in which each patient in hospital paid in accordance with his means, and those too poor were paid for by the district from which they came, as in Germany.

Hospital Management Considered with Reference to Responsibility.

Mr. J. DANVERS POWER, M.V.O., read a paper on this subject. He said it might be thought that any condition of affairs under which a public necessity was supplied by private generosity was likely to bring out some of human nature's better feelings. Unfortunately the reverse was the case. Every hospital manager knew that the coroner's jury, the Poor Law guardian, even newspaper editors of a kind, fell with great ease into a state of joyful readiness to fear the worst whenever a hospital was attacked. It was far too late in the day to tell them that subscribers could do as they pleased with their own. The responsibility of a hospital committee could no longer be limited to the roomful of empty chairs known as the annual meeting of governors and members. The chief importance of this fact at the present time lay in the danger of State interference with hospital work. It would, he thought, be admitted that destructive legislation was nearly always preceded by a cloud of prejudice; and in all attempts to deal with prejudice which he had had opportunities of observing, nothing had struck him more than the important part which responsibility played. Responsibility, placed on the right shoulders, would have killed half the so-called hospital scandals of recent years even after the fact; while, under a proper allocation of it from the outset, the other half would never have come to birth at all. In the case of hospitals, an example of divided responsibility which at once occurred to the mind was to be found in the work of the staff and the lay committee. About some of that work there could be no question. But there was a wide stretch of country between the physician's prescription and the kitchenmaid's evening out. Another example of responsibility divided between staff and committee was to be found in connexion with the admission of patients—a frequent subject of complaint by hospital critics, at any rate in London. It was said that wards were unduly filled with doctors' "request" cases, and that "uninteresting" illness was at a disadvantage. It was clear that none but a doctor could say whether a doubtful case was a proper one for admission; and personally he believed that in this matter the public would, on the

whole, be better off in the doctors' hands alone than under any system of interference by the subscribers. The rise of the central collecting fund also raised some important considerations connected with responsibility. The managers of these funds owed their first duty to those whose money they handled. They must consider destination, necessity, and economy. If a question arose as to money granted going directly or indirectly to medical schools they would properly take the best advice they could get, the more independent the better, and act upon it. If a hospital were already fully endowed they would not proceed to overendow it by grants. If a hospital wasted its subscribers' money they would not give it more than would have been necessary had it acted prudently. In all these matters the fund must take the responsibility of its own acts. But in order to be able to act, it must be in a position to judge. It could not judge without uniform accounts and statistics from the various institutions, and an excellent example of the wise allocation of responsibility within responsibility was to be found in the course taken on the establishment of the existing revised system, which was the work of representative hospital secretaries themselves, assisted by the highest professional advice. The collecting fund might also disseminate information which only such a fund could conveniently collect. It might arbitrate in cases of dispute, if invited to do so. But anything beyond this should be very carefully considered. There might be no harm in sending visitors to make an amateur inspection of a hospital. But he was very strongly opposed to a central fund giving any definite advice on internal management unless it was prepared to take the responsibility for the consequences. That was a test which, in common fairness, should never be lost sight of. The very life of the voluntary hospital system was local management. If that were once touched by central authority in the matter of details, the best argument for the retention of the voluntary system was taken away. With any such proceeding he would in no case be associated, but if others differed at least he ventured to advise that responsibility should never be divided.

Mr. GILBERT BARLING (Birmingham General Hospital) agreed there must be one responsible body for the administration of the hospitals, and the management committee or board must be the authority. The question was how could they satisfy a voluntary medical staff without splitting authority. With regard to the voluntary hospital system, there was so much to be said for it that he desired himself that it should continue to be their system; but he did not desire to see the voluntary system continued unless it were to be an efficient system. The question of efficiency greatly depended upon money. He acknowledged that many Poor Law infirmaries were efficient and well administered, but there was still an atmosphere of Poor Law about them, and people felt that they would rather avoid the Poor Law and prefer to go to the municipal or voluntary hospital. He felt that hospital treatment must become more and more expensive as it became more and more specialized, but whilst that was so one could not help being struck by the way in which expenditure was kept within bounds by the constant supervision of the accounts. In regard to Mr. Danvers Power's remarks on "request" cases, he asked how were cases to be admitted? He thought they would do away with the ticket system if they could, but this system was responsible for an annual income of about £3,000, and how were they to make that up? He thought the best way was to keep the system, but to work it in a reasonable spirit.

Mr. DANVERS POWER, in replying, said what he wanted to deal with was this: that the public was on the one side and the hospital on the other. The public would criticize the hospital if it had half a chance, and he contended that the public, when it began its criticism, should know whether it was criticizing the management, the medical staff, or the religious side of the hospital. He was afraid the question of efficiency that Mr. Barling hoped would be forwarded, or thought might be forwarded, by some State or municipal system would be a subject of party warfare. He was very much afraid he would find in other parts of the country that State or municipal hospitals would provide very inferior results to those now being shown by the voluntary system.

SCIENCE NOTES.

THOSE who desire to read Mr. J. Reid Moir's own account of the circumstances attending the finding of the human skeleton in a glacial deposit at Ipswich—a discovery to which many references have recently been made in these columns, the last by Professor Keith in his address to the British Association—will find the text in the *Proceedings of the Prehistoric Society of East Anglia for 1910–12* (vol. i, Part II, London, H. K. Lewis, price 3s. 6d.). The paper is illustrated by a diagram of the relation of the strata at the place where the discovery was made and a photograph showing how very near the surface the remains lay. Mr. Moir's paper is followed by a description of the skeleton by Dr. Keith, illustrated by a diagram showing the flexed position in which the remains lay, diagrams of the skull, and photographs of the remains in the Museum of the Royal College of Surgeons still embedded in the original matrix. In this instance the value of the discovery was greatly increased by the fact that Mr. Moir, finding the bones very friable, did not attempt to detach them, but removed the whole block of material in which they lay. The same issue of the *Proceedings* contains two papers by Dr. Allen Sturge, a vice-president and former president of the society. The one, of a highly technical character, deals with the patina of flint implements, and gives the result of an elaborate study of his own large collection of such implements. The second paper deals with implements of the later palaeolithic cave period in East Anglia, and is illustrated by a large number of photographs. The *Proceedings* also contain a valuable discussion by Mr. F. N. Haward on the chipping of flints by natural agencies. The general conclusions with regard to the chipped stones called "eoliths" are that too much importance has been attached to the similarity of shape only, too little notice taken of the rubbish associated with them, and too little regard paid to the action of Nature in the past. With regard to the reference to eoliths contained in Professor Keith's address, we have received the following note from Mr. Benjamin Harrison:

> May I correct a mistake concerning the discovery of eoliths, and my share in it, which is contained in Professor Keith's admirable lecture on the antiquity of man, printed in your issue of September 21st?
>
> Professor Keith says that the Kentish plateau eoliths were first found by Professor Prestwich in 1859, and then goes on to say: "Thousands of these eoliths were collected by Mr. Benjamin Harrison."
>
> As a matter of fact, Professor Prestwich saw the first eoliths in 1888, when I brought them before him, whereas I first discovered them in 1865.

Dr. Hermann Dold, in a recent essay[1] on the highly important but still unsolved problems as to the essential nature of anaphylaxis, accepts the opinion of Friedberger that the doctrine of the specificity of antigens and antibodies is not violated by the assumption that non-specific toxic substance (anaphylatoxin) may be formed from specific albumoses by the agency of either specific or non-specific antibodies. In other words, whilst the intact albumose and perhaps also the most complex of its decomposition products remain specific, the further products of decomposition are no longer specific, but possess in common the properties of anaphylatoxin without reference to the original substance from which they were derived. The formation of these non-specific substances is, in his opinion, the explanation of the fact that symptoms alike in character are often found in infections due to widely different micro-organisms. Many infections, for example, which have nothing to do with the cholera bacillus may produce a clinical picture closely resembling cholera. He considers, furthermore, that the formation of anaphylatoxin must be regarded as distinct from those processes of bacteriolysis which lead to the liberation of endotoxins. In natural infections, apart from such specific toxin formation as occurs in diphtheria and tetanus, there are three distinct processes simultaneously at work—bacteriolysis, phagocytosis, and formation of anaphylatoxin; these three interfere with each other in greater or less degree, and so add to the variety and complexity o the clinical manifestations. It is impossible, in the present limitations of our

[1] *Das Bakterien-Anaphylatoxin und seine Bedeutung für die Infektion.* Von Dr. Hermann Dold. Jena: Gustav Fischer. 1912. (Demy 8vo, pp. 80; Taf. 44, 6 Herv., 4 Abb M. 2.80.)

knowledge, to give preference to one or other of the numerous rival theories which have been put forward in explanation of anaphylaxis, but it may be said that Dr. Dold advocates his case skilfully and bases his arguments on an interesting series of carefully planned laboratory experiments.

Decastello and Krjukoff have published a monograph[1] on the structure of the blood cells which contains several new ideas. They take exception to the very general view that the blood cells, and more particularly their nuclei, are of the nature of vesicles enclosed in a membrane. They consider that a much more accurate conception is obtained by regarding them as agglomerations of highly convoluted strands or fibres. With regard to the polymorphs, their view is that the transformation from the originally compact nucleus into the multipartite form is not a result of external forces, but is due to an inherent modifying tendency of the nuclear strands themselves. The nucleus and the cytoplasm are not, anatomically and functionally, so essentially distinct as is generally supposed; they are, indeed, most intimately bound up with each other, and many strands from the nucleus pass into the cytoplasm and become constituent parts thereof. In regard to the cell granules, they hold the view that they are not products of secretion, but that they are variously modified segments of the karyogenetic strands. The blood platelets, again, undoubtedly arise from the cytoplasm of the leucocytes and show structural differences according to the type of cell from which they have derived their origin. As a logical conclusion, Decastello and Krjukoff do not confine their views to the cells of the blood, but extend them as of general applicability to all cells. It is not easy to criticize these views without actually repeating the observations along the lines adopted. The idea of the intimate connexion between the nucleus and cytoplasm is new, not so much in sense as in form. Recent researches have gone far to show that the two parts of the cell are not so sharply differentiated as was believed ten or twenty years ago, but it is difficult to admit at first sight that the morphological connexion is so closely connected as they would make out. We do not doubt the correctness of their observations, but the matter leaves room for much variety of interpretation. Their opinion on the evolution of the polymorph nucleus is a trifle obscure. The work, however, is worthy of serious consideration.

LITERARY NOTES.

AN amusing account of Vichy in the seventeenth century is given by Madame de Sévigné. In a letter to her daughter, Madame de Grignan, dated May 20th, 1676, she says:

I took the waters this morning, my dearest, Oh how nasty they are! . . . We go at six o'clock to the spring, everybody is there. We drink and make very wry faces, for only fancy! they are boiling hot and have a very unpleasant taste of salt petre. We go and come, take a walk, hear mass, pass the waters, speak confidently of the manner in which we do this; this is the only subject of conversation till noon. Then we dine. After dinner we spend the afternoon with some one of the party. To-day it is my turn to be hostess. . . . At five o'clock we take a walk in delightful country. At seven we have a light supper and at ten we go to bed.

In another letter, dated May 28th, she says:

I began the douche to-day. It is a fairly good rehearsal of purgatory. One is naked in a little underground place, where there is a pipe of the hot water, which a woman plays on you wherever you wish. This state, in which one scarcely retains a fig leaf by way of clothing, is somewhat humiliating. I should have liked to have had my two maids that I might see some one whom I knew. Behind a curtain is placed some one who keeps up your courage during half an hour. In my case it was a doctor from Gannat, whom Madame de Noailles has taken with her to all her watering places. She likes him much. He is a very honest fellow—not a quack, and without prejudices. She sent him to me out of pure friendship. I will keep him, whatever it costs, for the doctors here are unbearable, and this man amuses me. He is not like an uncouth doctor. . . . He has wit and good manners. He knows the world, and I am satisfied with him. He spoke to me while I was in torture. Picture to yourself a jet of water as boiling hot as you can imagine thrown against any part of your poor body. At first the alarm is spread everywhere in order to stir the spirits into movement. Then an attack is made on the joints which are affected. But when they come to the nape of the neck it is a kind of fire and a surprise beyond understanding. That, however, is the essence of the matter. Everything has to be suffered and one does suffer everything, and one is not burnt, and afterwards we go to a warm bed where we sweat profusely and it is that which cures us. Here, again, is where my doctor is good. For instead of leaving me to two hours of the boredom, which is inseparable from the sweating, I make him read to me and that amuses me.

On June 1st she recurs to her doctor, whom she is trying to induce to study the philosophy of Descartes, and she says:

He knows how to live. He is not a quack. He practises medicine as a gentleman.

We hear more of her doctors over twenty years later in a letter written from Bourbon on September 22nd, 1687:

We have a doctor who pleases me. This is Amiot, a man with a reasonable dislike of bleeding. He has a good opinion of Vichy, but is convinced that the water of this place will do me at least as much good. As for the douche he will have it administered as delicately as if he did not wish me to have it at all. He says we should inform M. Alliot that the remedy is too violent and more apt to excite the nerves than to cure them; that purging the humours and the sweatings which the water and the hot baths will cause will be enough. He speaks sensibly and will guide me with the greatest care.

Elsewhere she says of Amiot:

Besides being a very good physician, he has here a little apothecary who is capacity, wisdom, and experience itself. Both say, No douche. They would think it a crime to attack a health such as mine. In a word, they excite confidence by being the first to condemn their remedies when they are not suitable.

The Boy Scout movement, so deservedly popular in England, has proved such a signal success in America that a demand has arisen in that country for a similar association for girls. In place, however, of an organization formed on the lines of the girl scouts, such as has been started on this side of the Atlantic, there has been founded a society of "Camp Fire Girls," an interesting account of which has been given by Dr. Luther H. Gulick in the September number of *The Child*. The ostensible purpose of this association, he says, is to encourage girls of all classes to lead "a healthy, out-of-door life under conditions similar to those planned for the boy scout." But the movement has, in reality, a far wider aim than the fostering of the virtues of courage and self-reliance in the future mothers of the American nation, and in course of time should have a far-reaching effect upon the future of the race itself. Its founders have realized that "protection of infant life is the basis of racial improvement, and is as essential to national progress as other economic necessities"; and the Camp Fire Girls are taught above all else the art of home-making and the care of children. There is every reason to hope, therefore, that thus equipped for their life-work, the next generation of American women will be able to avoid the mistakes of the present, and so prevent in great part the frightful waste in child life which to-day forms one of America's most pressing problems. The high rate of infant mortality is the subject of an article by Dr. Joseph S. Neff which appears in the same number of *The Child*. The author demonstrates the usefulness of "Milk-shows" and similar exhibitions as a means of educating ignorant or indifferent parents in their duty towards their children. These exhibitions are largely used in the United States for the purpose of showing the dangers of improper feeding; and the success of this second "Children's Crusade" may be judged from the fact that in Philadelphia alone the returns for the year 1911 show a reduction of 12 per cent. in the mortality amongst babies under one year of age as compared with that of the previous year. The same number of *The Child* also contains an interesting discussion by Dr. Gordon Evans as to the choice of an anaesthetic for children, and an article by Dr. H. Maughan Brown on the effects of wage earning amongst working schoolboys; whilst Madame Emilia V. Kanthack de Voss has contributed a short account of the Child Study and School Hygiene Section of the Royal Institute of Public Health Congress held last July in Berlin.

[1] *Untersuchungen über die Struktur der Blutzellen.* By Priv.-Doz. Dr. Alfred v. Decastello and Dr. Alexander Krjukoff. Berlin and Vienna: Urban and Schwarzenberg. 1911. (Sup. roy. 8vo. pp. 126, with 8 chromolithographic plates. M.16; bound M.18.)

British Medical Journal.

SATURDAY, SEPTEMBER 28TH, 1912.

THE TREATMENT OF CANCER.

LAST week we published an abstract of the address on the non-operative treatment of cancer delivered by Professor Czerny of Heidelberg before the congress of German scientists and physicians at Münster. This utterance has been anxiously awaited, the more so as Dr. Zeller[1] recently published an account of his method of treating cases of the disease, for which he claims remarkable success. We must confess that the perusal of Professor Czerny's address has disappointed our hopes, even though the improbability of its containing an announcement of sensational character was recognized. Looked at broadly, Professor Czerny's opinion on the subject appears to be somewhat as follows: When a cancer can be radically removed, operative treatment is at present by far the best. On the other hand, when the disease has reached that stage where it is the mere despair of surgery—that is, when it has become complicated by metastasis to internal organs and by cachexia—the only thing to be done is to apply such means as may lessen the suffering of the patient and keep him as comfortable as possible in the last stage of his disease. But between these extremes there are many cases in which surgical treatment alone is unlikely to effect a cure and for which palliative measures are not appropriate. A host of remedies exist, which may be employed in these cases, although the practitioner is not justified in the present state of knowledge in building great hopes on any of them. These remedies may be regarded as agents which attack the cancer cells directly or which produce some indirect effect on the growth. Of the former class, the varieties of therapeutic rays—such as those emitted from the Roentgen apparatus, from radium, actinium, mesothorium, and the like—and fulguration and its modifications have apparently yielded the best results in Professor Czerny's hands. When the growth can be reached directly he removes as much as he can by a surgical operation and destroys the rest *in situ* by one or other of these means. But he warns us that the rays will not prevent recurrence. He therefore attempts to supplement this direct local treatment by indirect and more general methods, such as the intravenous or subcutaneous exhibition or cholin combined with boron, or silicic acid, while he aims at improving the condition of the patient by the exhibition of arsenic and other forms of tonic treatment. But he does not claim when all this has been carried out to be able to guarantee cure. His remarks on Dr. Zeller's arsenic paste are cautious, and he merely states that some very remarkable results have been achieved by its means, but that sufficient time has not yet elapsed for the observer to form an opinion as to the curative effect.

In all this Professor Czerny has scarcely told us anything new. True, his utterances will do good by urging the medical world to regard "cures" of cancer with caution, if not with suspicion. But the victim of cancer is in the same position to-day as he was yesterday, and unfortunately we can only repeat the opinion we have often expressed, that the surgical treatment of malignant disease, provided the operation is performed at an early stage, is still the one treatment which offers real hope of cure.

There is a very serious aspect of this matter, apart from the urgency of the case from the point of view of the patient. Professor Czerny touched on a very large number of methods of treating cancer which have been introduced within comparatively recent times, and said that each year brings forth fresh ones. In many instances the introducer of the method, directly or indirectly, proclaims that his remedy will effect a cure. In the interest of the public we would urge that each new remedy or method of treatment should be exhaustively investigated before any announcements as to its efficacy are published. We even regard it as inadvisable to deal with these matters in medical journals at an early stage and on short clinical experience alone, for what appears in the professional press soon finds its way to the public, and out of the modest statements of the scientific investigator may grow an altogether disproportionate assertion to the public that a cure has been discovered.

Who is to carry out the investigation of a new remedy? And where should this be done? Professor Czerny suggests that the State should equip and support institutions for this purpose, and expresses the opinion that if Germany and England were to have some forty such institutions apiece, the cancer question would be solved in fifty years, and the incidence of the disease would be reduced by one-half within that period. We agree that the cost of searching for a true explanation of malignant disease and for a cure should be borne by the community, since the community will gain by a solution of the problem. But in this country, at least, some difficulties would arise were a number of institutions founded by the State. The chief difficulty would be that for practical working these institutions would have to be attached to hospitals or clinics, and as long as hospitals remain free from State control such a plan would present many pitfalls. On the other hand, a State subsidy, if of sufficient magnitude to ensure success, might with advantage be granted. This sum could be distributed to the research departments of hospitals, or, in the case of hospitals which do not possess them, for the purpose of enabling them to create such departments, in order that the work might be carried out by expert workers under the supervision of clinicians and an experienced head of the department. We feel convinced that those practitioners whose ingenuity enables them to suggest fresh modes of grappling with the problem would find welcome and assistance in these departments and a fruitful field for their activities therein.

[1] *Muench. med. Woch.*, August 20th and 27th, 1912; and BRITISH MEDICAL JOURNAL, September 14th, 1912, p. 653.

FICTION ABOUT HOSPITALS.

AT the conference of the British Hospitals Association, held last week at Birmingham, Mr. Danvers Power, discussing the question of responsibility in relation to hospital management, said it might be thought that institutions which are necessary to the people and are supported by private generosity would be likely to bring out some of human nature's best feelings. But it is notorious that the reverse is the case. Men of all kinds take a pleasure in girding at hospitals. The coroner's jury, the Poor Law guardian, the newspaper editor, "fall with great

ease into a state of joyful readiness to fear the worst whenever a hospital is attacked." A particularly flagrant example of this readiness to believe evil has just come under our notice.

In a recent number of Cassell's *Magazine of Fiction* an article by Pearkes Withers, a writer whose name is unknown to us, entitled "The Scandal of our Hospitals," appropriately finds a place. The "scandal," we gather, is that hospitals are used as "training grounds for the medical men of to-morrow, experimenting grounds for the medical men of to-day." Then we have the old parrot cry about the number of students who "walk" the hospital, the number of cases upon which unfeeling demonstrations are made by doctors, the number of perfectly needless operations, and so forth. Complaint is made that patients are not always admitted. "'We are full,' the officials cry, with a ward of empty beds and the spiders busy upon the doorposts. 'You must pay or get a letter,' they declare, unmindful of the fact that they are pledged to tend the necessitous sick free of charge." Evidently Pearkes Withers has no first-hand knowledge of hospitals, or he would be aware that they are in a chronic state of congestion. He would know, too, that they do not take payment, and that the complaint against them is just the other way—that they sometimes take patients who could very well afford to pay. That is the real hospital scandal.

Pearkes Withers is good enough to admit that the hospital undoubtedly endeavours to cure; but he adds that it is before all things determined to teach, and in teaching it takes the meanest advantage of poverty. He pictures the feelings of a wealthy middle-class merchant if a doctor called in to attend his wife in illness brought a dozen students with him into the sick-room, and, ignoring the wife's agony and need of immediate attention, discoursed learnedly upon her sufferings to the staring youths. Yet, he says, such an incident is the veriest commonplace of a lying-in hospital. Now, if this writer knew anything at all about hospitals, he would know that a lying-in hospital is the place of all others where such a scene is almost inconceivable. The lying-in hospitals are very few, and admission to them is jealously guarded. And may we ask Pearkes Withers how he supposes medical students are to learn their business unless it is by seeing patients treated and helping to carry out the details? Would he care to be attended by a man who had never been inside a hospital ward, or to have his wife ministered to in her hour of travail by one who had never seen or assisted in a delivery? As for the suggestion that patients are made the "victims of surgical science in hospitals," this insinuation again betrays an ignorance that should have prevented this confident critic of hospitals from attacking these institutions. It has been truly said that in these days it is the poor that get the very best of surgical treatment. The real need is provision for the middle classes, who cannot afford to pay for the costly ritual of modern surgery. This raises a question which it would carry us too far to discuss here, and that is the erection of hospitals or of departments in general hospitals for the rich. Lord Salisbury not long ago called attention to the fact that the Duchess of Connaught when ill recently in Canada had herself taken to a hospital. As every one who knows hospitals from the inside can testify, patients are better looked after in a hospital than they could be in their own homes, and we may point out to Pearkes Withers that the very publicity of which he complains and the presence of students is the strongest possible guarantee against abuse. He insists that though doctors must be trained their education must not be obtained under false pretences. "It is for the patients to decide whether or not they shall be mauled about by incompetent youngsters." The animus of the writer is well displayed by this sentence. That students do examine patients is, of course, true, and it would be interesting to know how the hand, the eye, and the ear are to be educated to the delicate work unless by practice on living patients. Would Pearkes Withers place much confidence in an examination made by a practitioner who had never before examined a chest? He draws a picture which would be touching if it were not so ludicrously unlike the truth, of a sensitive young woman objecting to have her case lectured upon before a score of young men, and he says it should be made a legal offence to force any woman or girl to uncover her body so that it may be inspected by a swarm of mere students. In the first place, no one is forced. If a patient objects to such examination, her scruples will in practice be respected, and, of course, in any case she has the alternative of leaving the hospital. In the second place, we should like to know precisely at what time a practitioner becomes, in Pearkes Withers's opinion, capable of seeing an uncovered body. Obviously not when he is a mere student; then, presumably, when he is qualified. But a man who had never seen the naked body would stand a poor chance of ever being qualified, and we do not think that even if he managed to get qualified a woman would care to know that she was absolutely the first he had examined. The fact is that, as any one conversant with hospital life could have told him, objections of this kind are extremely rare, and the picture is the product of a prurient imagination.

Then we are told further that it should be made a criminal attempt for hospital doctors to neglect the common, but none the less serious, ailments of humanity in favour of out of the way maladies. Hospitals, it is sagely said, are supposed to exist for the alleviation of human suffering of every kind. If Pearkes Withers would look in at any out-patient department he would see for himself every variety of human ailment attended to with such care as the enormous crowds of patients allow the overworked staff to exercise. But a moment's thought should enable him to understand that Mrs. A. with the "windy spasms," Mrs. B. with a chronic ulcer of the leg, and such like, cannot be treated as in-patients, or there would be no room for cases in which there is imminent danger to life. He complains, too, of the long wait the patients must go through before they are attended to. But he suggests no means of remedying this. It is like the queue at a theatre—all cannot get in at once. All that can be done is to expedite the business as much as possible. And here we are confronted with another charge—namely, want of attention. Exactly the same thing occurs in the waiting-rooms of many busy physicians, and in the one case as in the other the only solution is that if the patient will not wait he is free to go elsewhere. The writer suggests that it would be infinitely cheaper and more satisfactory for many patients to consult cheap doctors round about. This is just what has been said over and over again by ourselves and others; but the fact is that patients prefer to go to the hospitals, and against this feeling no argument seems to prevail. Let us hope that the promised conversion of out-patient into consultative departments may do something to remove this grievance

We cannot go over in further detail the misrepresentations in the article. We have the eternal old story of the brutality of surgeons, of sour-faced nurses, and so on. Pearkes Withers has seen eminent surgeons listen to women's stories of intense agony with unmoved faces. Would he have them weep over every case of human suffering that comes before them, like Baines Carew, the sentimental attorney in the *Bab Ballads?* How does he suppose a doctor could ever get through his work unless he steeled himself to be "unmoved"? Yet we who know could tell him of surgeons who would probably have shocked his sensitive nerves by their jests in the presence of suffering, and who yet underwent agonies of self-reproach if they fancied they had not done just the right thing, and who, not satisfied with the hospital brandy for instance, paid for a better quality out of their own pockets. The article is simply an appeal to cheap sentimentalism, and for disproof of his charges Pearkes Withers need only go and see for himself how things really are.

A particularly absurd charge is one made as to the economy with which hospitals are run, an economy, we are told, which is to the detriment of the patient. The following interesting story gives us a measure of the author's insight: "I looked up Quain's *Medical Dictionary*, and it says I ought to have sulphate of zinc and cocaine," complained a daring out-patient who had been struggling hopelessly along for months with the hospital's boracic lotion for a certain form of inflammation. "Oh, indeed," snapped the doctor, "and do you know how much cocaine is an ounce? Do you suppose a hospital can afford to give expensive drugs like cocaine away by the gallon?" Gallons in the case of lotions would seem to be a stretch of fancy, but in any case does the author seriously think that the patient is to prescribe for the doctor whom he consults? Quain's *Dictionary* is not infallible, even where it is not yet out of date. The story reminds us of another patient of the same inquiring turn of mind, who was being treated for a skin affection. He also consulted the oracle, but he found that the disease with which he was afflicted was described in the Appendix. At the next interview he reproached the doctor with never having told him that the seat of his disease was the appendix.

Messrs. Cassell publish a number of well-known medical books, necessarily founded on hospital experience, and we can only express surprise that the firm should have allowed a foolish and spiteful article of this kind to appear in one of their publications.

SALVARSAN AND NERVE COMPLICATIONS.

As a counterblast to the criticisms of Professor Finger of Vienna, which were dealt with fully in the BRITISH MEDICAL JOURNAL of January 27th, Dr. Benario has published a monograph on nerve complications which have been observed to follow the administration of salvarsan and of mercury,[1] to which Professor Ehrlich himself has contributed a preface. In the compilation of his book Dr. Benario has displayed great industry, but it is necessary to insist on the fact that it is merely a compilation, and is not founded on any special personal knowledge of syphilis. The author does not frankly face the fact that the use of salvarsan has been followed by nervous complications, which have not always given way to more salvarsan, to say nothing of the deaths, recorded and unrecorded, that have occurred after salvarsan competently administered, and usually after a second injection. His advocacy is therefore likely to do the cause for which he pleads more harm than good. Salvarsan does clear up certain severe symptoms with a celerity that is in a way wonderful when compared with previous experience; yet time, though short, has already shown that salvarsan alone cannot be relied on. If any proof of this were required, a reference to the leaflet on neo-salvarsan issued by the makers under the aegis of Professor Ehrlich's name would suffice, for there it is definitely stated that "a combined treatment with mercury, as experience with salvarsan has already shown, is to be recommended." As to the fatal cases, it is merely begging the question to say that in them the classical symptoms of arsenical poisoning were not present. The classical symptoms hitherto described were not the result of a synthetic compound injected intramuscularly and intravenously.

But to return more especially to Dr. Benario's points, the whole of the reasoning from the figures he puts forward is vitiated by the fact that they are erroneous. In the statistics of nervous complications set forth (page 139), the number of cases treated by salvarsan and the percentages as worked out show, for instance, that out of Wechselmann's 2,800 there were nervous complications in 10 (= 0.37 per cent.), of Weintraud's 1,500 there were 13 (= 0.9 per cent.), of Arning's 1,000 there were 2 (= 0.2 per cent)., whereas in Finger's statistics of 500 cases there were 44 (= 9 per cent.). This large discrepancy is explained by the fact that in the case of Wechselmann, Weintraud, and Arning, only a very small number of the individuals treated could be kept under observation, whereas 75 per cent. of Finger's cases were carefully followed up. Yet Dr. Benario does not allude to this important difference in the totals. Such a statistical method is in itself sufficient to knock the bottom out of the conclusions he arrives at. As already stated, this sort of manipulation of figures can only tend to bring discredit on a valuable method of treatment, which it is very important to judge fairly and squarely on its merits.

The careful and painstaking observations of a reasonable number of patients is more likely to guide us to a right appreciation of the value of a method of treatment than thousands of cases hurriedly dealt with. The prosecution of truly scientific inquiry demands patience. It is essential, if we are to get a little deeper into the numerous problems with which we are faced, that we should not imitate the methods of professional politicians.

[1] *Ueber Neurorezidive nach Salvarsan- und nach Quicksilberbehandlung.* Munich. 1911.

A PUBLIC MENACE.

SOME of the proposals at the present time being made in connexion with schemes for the treatment of tuberculosis accentuate a tendency which is becoming a serious menace to the efficiency of the medical service of this country. We refer to the proposals to set up tuberculosis dispensaries, staffed by whole-time officers, to which the public will have practically free access, and in connexion with which gradually all, or nearly all, of the treatment of tuberculosis will be carried out. At first blush the idea seems tempting. To the mere administrator it seems almost irresistible, for it suggests specialization, administrative compactness, and co-ordination with other hygienic measures. On the other hand it appeals by its apparent simplicity and directness to many

ardent sanitary and social reformers who are deeply interested in the new crusade against tuberculosis. But when closely examined the plan, except possibly from the administrative point of view, has few advantages, and these are far outweighed by the damage to the efficiency of the general medical service which is inherent in the scheme. It is universally recognized that if tuberculosis is to be dealt with successfully the cases must be caught early, and the best prospect of doing this lies in the utilization of the family practitioner who knows the family history and the home conditions and is relied upon by his patients as a friend as well as a professional adviser. Nobody knows so well as the general practitioner how difficult it often is to say, in the case of the delicate youth, where debility or anaemia ends and tuberculosis begins. Apart from general sanitary and housing reforms, the real hope of a successful tuberculosis crusade rests with the general practitioners of the country, in whose hands the bulk of the suspected cases first come, and by whose activities and influence if properly employed and directed the physical condition and home surroundings of the patient may most easily and most powerfully be influenced. We are well aware that at present many people cannot be said to have a family doctor, but the difficulty with most of these is largely financial, and that is a difficulty the local authorities now have the opportunity of surmounting. The necessity of their so doing is emphasized in the letter of Dr. Lauriston Shaw on p. 820, and his testimony is all the more valuable coming as it does from a consulting physician. It seems to us, therefore, the height of folly to inaugurate a campaign, which can so easily now be put on the right course, on lines which are demonstrably wrong. Already some local authorities have formulated schemes which can only mean that they hope in the near future to have every case of tuberculosis which is not confined to bed treated by whole-time officers at dispensaries or sanatoriums. Were this attempt to be successful what would be the result? The general practitioner would lose first his clinical experience of this disease, then his interest in it, and the inevitable sequence would be that many cases would escape detection in their earliest and most hopeful stage. Surely here is an opportunity, not for making a "corner" in the treatment of tuberculosis, but for so distributing the work as to interest and employ every general practitioner in the land, with a corresponding claim on the part of the community for increased efficiency and alertness on the part of the practitioner. These remarks have special reference to tuberculosis schemes because these are at present very much in the public eye, but the same tendency has been exhibited in other quarters, more particularly in relation to the treatment of school children. We feel it our duty to protest in the most emphatic manner against all attempts to take the treatment of disease out of the hands of the private practitioners of the country and put it into the hands of officials. Such a course, if successful, can only result in the lessening of the clinical experience and the lowering of the general efficiency of those who must always be the first line of defence of the public against disease. The supply of well-trained, efficient, and alert practitioners, available to the public at large in all places and at all times, is to the public, in the literal sense of a hackneyed phrase, "a matter of life and death."

MORE INSURANCE BLUFFS.

The kite as to the impending breakdown of the "doctors' boycott," to which we called attention in the Journal of September 14th, has already, like so many others sent up from the same quarters, sailed "afay in de Ewigkeit." Another which seems also to have vanished into space is the report that the British Medical Association pledge is to be submitted to the law officers of the Crown as being in restraint of trade! Then we hear of a solid array of four thousand men who are said to be ready to take the dole offered by the Government. It is not long since we were told that ten thousand men would be needed to work the Act, and that they would easily be found. They have not, as we foretold at the time, been found; and there is every reason to think that the four thousand—or, to be exact, four thousand two hundred—are as imaginary as Falstaff's men in buckram. Now comes a mysterious advertisement under the heading, "The National Insurance Medical Association," inviting tenders for 1,000 motor cars. The tenders are to be sent to Dr. Charles Frederick Knight, the Organizing Secretary of the Association, which it may be well to recall is described as "being composed of members of the medical profession in Great Britain who are willing to accept posts under the Insurance Act of 1911." Dr. Knight, who was till lately, we believe, a successful "coach," may perhaps be seeking to provide his pupils with more rapid means of progression; but as he now, it is said, holds an office under the Scottish Insurance Commissioners, it would seem to be more likely that he is seeking to make arrangements to assist in working the Act. So far, we believe, not half a dozen men in Scotland have consented to work under the Act; it will be interesting, therefore, to see where Dr. Knight will get the passengers for his motors. But these "kites" are instructive as showing which way the wind blows. The number and variety of the attempts to put the situation in a false light before the public prove the ingenuity of their authors, but they also indicate a growing anxiety on the part of the begetters of the Act. If the profession will not let itself be frighted with false fire, but will stand firm in insisting on fair treatment, the issue of the battle which has been forced upon it cannot be doubtful. The country could, perhaps, do without Mr. Lloyd George, but it could not do without the doctors. That is the strength of our position—a fact which is thoroughly understood by those who are so sedulously trying to break up our serried ranks by manœuvres familiar to politicians.

THE REMUNERATION QUESTION AND THE PUBLIC.

During the Midlothian contest the Liberal candidate, Mr. Alexander Shaw, was heckled on the question of the remuneration of doctors under the Insurance Act. He was, according to a report which appeared in the *Aberdeen Daily Journal* of August 26th, asked "whether, since he and Mr. Lloyd George consider a doctor is well paid when he receives 4s. 6d. a year for each person, he would be in favour of giving every person legal advice at the same money—one penny per week?" To which Mr. Shaw replied: "I do not know! . . . There is a thing called a poor man's lawyer, who does things in that way. Of course, the value of the opinion you get may be just worth the amount paid for it." We welcome this testimony from an unexpected quarter to the soundness of the doctrine that sweated labour in any sphere of activity is worth little or nothing. Mr. Lloyd George as a lawyer will no doubt agree with Mr. Shaw, though he may not altogether approve of the frankness with which his youthful supporter gave away his case as to the payment of doctors. And cheap physicking is likely to be much more disastrous to the people than cheap law. We would also invite the Chancellor's attention to some wise words spoken by the Lord Mayor of Birmingham in welcoming the delegates at the recent conference of the British Hospitals Association. His lordship then took occasion to say that he wished the Government would realize "that they had a very strong public opinion in the direction of doctors being well paid." "They did not," he went on to say, "want strict calculations made as to what was the lowest sum that would be a living wage for the well-educated doctor. He thought it would be to the advantage of every one that, if the State

took over nearly all the services of the medical profession, it should so remunerate that profession as to attract the most skilful men in the country. No money could be better spent than in improving the general health of the community." We are sure that the Lord Mayor of Birmingham here represents the best public opinion. The friendly societies, as a rule, have hitherto made their bargains with their medical officers on a strict trade basis. For this we need not blame them; they could scarcely be expected to value the services of a doctor on any higher scale. But when the Government of the country engages the services of highly educated and specially trained men we may look for different treatment. The minimum wage for which men could be found willing to sell themselves into the bondage of a friendly society cannot be regarded as sufficient remuneration for the undertaking of larger responsibilities and the discharge of more exacting duties. If medical treatment under the Insurance Act is to be anything else than the old system of contract practice on a greatly magnified scale, the rate of payment must be such as will attract practitioners of the most efficient class. Insurance against sickness is nothing but an empty form of words unless the best medical attendance available is given. And this cannot be got on the terms offered by the Chancellor. In medicine, as in law, as Mr. Shaw so well said, "the value of the opinion you get may just be worth the amount paid for it."

PLANT CANCER.

IT would be a strange happening, indeed, if the secret of the cause of cancer were to be found in the daisy, and yet Mr. Erwin F. Smith and his lady assistants supply us[1] with facts derived from the study of the crown gall of that "modest, crimson-tipped flower" which seem to have a bearing upon the problem of malignancy whose importance cannot be denied. Of course a plant cancer cannot be expected to resemble a malignant growth in an animal or in the human subject in all particulars, for a plant differs from an animal in having no rapid blood stream circulating in it, and there are other differences; but these American workers in plant pathology are of opinion that the crown gall of the Paris daisy is exactly what a malignant tumour of a plant might be expected to be. There is, for instance, an enormous proliferation of certain cells of the plant without reference to physiological needs and in opposition to the best interests of the organism. The tumour is non-capsulate, shows no abscess cavities and no visible parasites; its growth is peripheral, and it has a well-developed stroma consisting of vessels and fibres; from the primary growth proceed strands of tumour tissue from which secondary tumours develop, and the secondary growths have a strong tendency to take on the structure of the part in which the primary tumour has developed—thus a crown gall of the stem is followed by secondary growths in the leaves composed in great part of descendants of the originally infected stem cells; and, finally, the primary tumour often originates in wounds, bruises, or irritated places. Mr. Erwin Smith admits one marked difference between his plant cancer and the malignant growth of the human subject—namely, that the former has been shown by him to be due to an intracellular schizomycete (*Bacterium tumefaciens*) which can be isolated in pure culture and by means of which the disease can be reproduced at will, whilst no such organism has been found in the latter. He does not suggest that the *Bacterium tumefaciens* is the cause of malignant growths in warm-blooded animals; but he claims some success in inoculating a cold-blooded creature (such as a fish) with it, and so causing a growth which has the characters of a sarcoma. There are difficulties to explain away in connexion more especially with the demonstration of the causal micro-organism in the cells which we cannot regard as unimportant; and whilst it may quite well be true that, as Mr. Erwin Smith maintains, we may have "in these particular plant overgrowths a key to unlock the whole cancer situation," we do not think the key has yet moved the lock. The work, however, is a thoroughly good and painstaking bit of research, the plates are most instructive, and the conclusions will stimulate other workers to enter upon this field of investigation.

[1] *On Some Resemblances of Crown Gall to Human Cancer.* By Erwin F. Smith. Reprinted from *Science*, new series, vol. xxxv, No. 892, pages 161–172, February 2nd, 1912. *The Structure and Development of Crown Gall; A Plant Cancer.* By Erwin F. Smith, Pathologist in charge of Laboratory of Plant Pathology, and Nellie A. Brown and Lucia McCulloch, Scientific Assistants, U.S. Department of Agriculture. Bureau of Plant Industry, Bulletin No. 255, pp. 60; plates 109. Washington: Government Printing Office.

FIFTY YEARS OF OVARIOTOMY IN FRANCE.

M. RICARD, of the Hôpital Saint-Antoine, records in a contemporary[1] the fact that just fifty years ago, on June 2nd, Koeberlé performed the first ovariotomy ever systematically undertaken on French territory. It was performed in Strassburg in the presence of Schützenberger, Hergott, Aubenas, and Hecht. According to custom, the case was referred to the Académie de Médecine, and a committee consisting of Nélaton, Malgaigne, and Huguier—names that have survived—examined Koeberlé's report. Already one of the three—Nélaton—returning in the autumn of 1861 from London, declared in the course of a clinical lecture that surgeons who undertook ovariotomy when it seemed justifiable should be commended rather than blamed. He added a qualification very strange when we bear in mind that he was a scientific surgeon and a great clinical observer, like Paget. Ovariotomy was indicated, he declared, when a multilocular cyst began to cause emaciation or serious complications. How he, who knew well enough the nature of ovarian cysts in their earlier stages, failed to see that their removal was indicated before emaciation set in or complications developed, it is hard to say. He had recently witnessed five ovariotomies performed by Baker Brown, and in some of them at least the disease could hardly have been advanced to that stage which, in Nélaton's opinion, called for operation. After Koeberlé's triumph, five weeks later to be precise, Nélaton himself operated. Boinet followed in September, 1862, and very soon after that date the operation was frequently undertaken in Parisian hospitals. As in other countries, sporadic cases of the removal of abdominal tumours which proved to be ovarian had been reported in France. Laumonier seems to have been the first French surgeon who removed an ovarian tumour. The operation was performed in 1781. M. Ricard rightly adds that ovariotomy opened the gates of abdominal surgery. In warning his pupils of the unseen dangers which might be encountered, one of the earlier French ovariotomists observed that the operation was a step into the unknown. It proved, however, a step towards a more satisfactory "unknown" than intestinal adhesions and suppuration of cyst walls. Péan, Doyen, and other Frenchmen, like their British, Continental, and American colleagues, opened up unknown developments of abdominal surgery. Lastly, Koeberlé, says Ricard, last of the veteran specialists, yet lives, ending in a dignified and by no means idle retreat his noble career as a surgeon. He graduated in 1853.

[1] "Le cinquantenaire de l'ovariotomie en France," *Gazette des hôpitaux*, June 4th, 1912, p. 952.

THE ENEMA IN THE EIGHTEENTH CENTURY.

As we know, the enema syringe in the seventeenth and eighteenth centuries was the symbol of medicine in France. The august body of Louis XIV was washed out by means of it some thousands of times, and it is recorded of a royal duchess that she had the *remède*, as it was politely called, furtively administered to her even in the presence of the Court. It was used by everybody who

could afford it, and it was a considerable source of income to the apothecaries. Naturally it did not escape the keen eye of Molière, who introduces it several times. He represents M. de Pourceaugnac being pursued with the instrument by a number of apothecaries, assuring him that it is benign, and in the ballet which concludes the *Malade Imaginaire* the apothecaries carrying the emblem play a conspicuous part. There is a curious record of an action brought in 1746 against a canon of Troyes, François Bourjeois, by what may be called a nurse specialist in the administration of enemas. This lady, who had the very appropriate name of Etiennette Boyeau, brought an action for recovery of moneys due to her for the innumerable enemas she had given the patient. As he would not pay, she put her case into the hands of an advocate named Grosley. His pleading, which is given in French memoirs in all seriousness but which reads like an elaborate jest, set forth that the canon had for some time been "vexed by a heated state of the viscera of that enormous acrimony which causes the generative parts to be extravasated." (Doubtless the writer meant piles.) Having consulted his physician, the canon was ordered the frequent use of "a kind of lenitive commonly known under the name of clyster." Etiennette Boyeau, who was in high repute for her skill in the administration of that remedy, was called in, and she attended on the canon two whole years, officiating at least once, sometimes as often as six times, a day. But, though she served him well and her fee was small, she could get no money out of the canon. "Three hundred times, at the most interesting moments and in the most supplicating position, she begged him to relieve her needs, without his allowing himself to be softened." At length, in 1746, she brought an action against him. In the pleading it is stated that "the Sieur Bourjeois took at least one enema a day and often six, thus taking the whole together on an average three enemas a day gives a total of 2,190 enemas, which at 2 sols 6 deniers make up the big figure of 273 livres 15 sols. Etiennette consents to reduce the total number of enemas to 2,000, and to reduce her bill to 150 livres instead of 273 livres 15 sols." The canon resisted, but at last, fearing the publicity of a law court, he paid up.

DEVELOPMENT OF SPIROCHAETA PALLIDA.

SOME fifteen years ago Kurloff described certain bodies which he had observed within the large mononuclear leucocytes of guinea-pigs. These inclusions, which have been generally known as Kurloff's bodies, have since been studied by a number of observers, and Dr. Ledingham eight or nine years ago suggested that they were possibly of a parasitic nature analogous to the *Cytorrycles variolae* or *vaccinae*. Last year Schilling studied their development in the mononuclear leucocytes by means of vital staining with azur, and arrived at the conclusion that the granule stage was preceded by a rod stage. Using the jelly method suggested by Sir Ronald Ross, and described by Mr. H. C. Ross in 1909, Mr. E. H. Ross has arrived at the conclusion that the bodies are lymphocytozoa and parasites of the mononuclear leucocytes only when they are in the intracorpuscular stage, and ultimately give rise to free swimming spirochaete-like bodies, which Sir Ronald Ross has suggested might be microgametes. He described and illustrated the development of the spirochaete-like bodies. Sir Ronald Ross now informs us that Mr. E. H. Ross, working in the McFadden Research Laboratories at the Lister Institute, has shown that the *Spirochaeta pallida* of syphilis has a very similar development. The well-known spirochaetes of syphilis appear to be homologues of the motile filaments as developed from the Kurloff bodies. In syphilis they are developed from large rounded bodies, found not in the mononuclear leucocytes of the blood, but in large mononuclear cells squeezed from local lymphatics.

THE PHYSIOLOGY OF BATHING.

AN international conference, organized by the Dutch Union for Public Baths and Baths in Schools, was held last month at Scheveningen near The Hague, under the chairmanship of Dr. W. P. Ruijsch, of the Dutch Sanitary Service. Several Continental Governments, as well as municipal councils, commissions of health, and other bodies, were represented by delegates. The delegates from Great Britain included Dr. David Walker of Bradford, Mr. A. L. Kiens of Battersea, and Dr. Fortescue Fox. In an introductory paper on the physiology of bathing, Dr. Fox said that the new knowledge of the action of baths was of such importance that it behoved all school and public authorities interested in bathing to avail themselves of it under competent medical guidance. Both the routine and the haphazard modes of bathing were frequently injurious. The sensitive and unprotected skin was derived from the same embryonic tissue as the nerve centres and the organ of mind, and like them it had become more and more specialized and sensitive in the process of human evolution. The reaction of the body to cold was a most impressive physiological fact. Within clearly-defined limits both positive and negative heat (*plus* and *minus* baths as respects the temperature of the body) were powerful stimulants or sedatives. This reaction was habitually defective in a large proportion of people. If in the community at large it were educated by appropriate baths, the result would be an increased resistance to disease, and especially to "chill" and the consequent invasion of micro-organisms. The body was wonderfully tolerant even of extreme and sudden changes of temperature, and *minus* after *plus* baths were the most suitable for general use in cold and temperate climates.

SLEEPING HOURS IN HOSPITALS.

IN a letter of some eloquence a layman asks us to call attention to the difficulties put in the way of sick people obtaining as much sleep as possible, which every one will admit to be desirable, by the arrangements existing in hospital and infirmary wards. The fact that lights are lowered about 8 p.m. in no way ensures, he points out, that the patients will immediately go to sleep; on the contrary, it is highly probable that many of them will lie awake for some time and not get soundly off to sleep, if at all, until half the night is over. Nevertheless the "brutal business of waking them" begins about 6 a.m. While all this is a fairly true picture, our correspondent's view that it is an unreasonable as well as undesirable condition of things, which medical men could at once put right if they wished, is by no means accurate. Many besides himself have been struck by the drawbacks of the early hours kept at hospitals, but no one has yet been able to think of a remedy which in the long run would not prove worse than the disease. It is inevitable that the nursing staff of a hospital shall be divided into a night and day shift, and that these shall unite forces in the early morning to get through the heavy work necessitated by the dawning of another day, including the washing and tidying of patients, and the preparation of some of them for breakfast and of others for operations. If this work were not shared some patients would not receive for hours the multitudinous attentions that almost all of them require as soon as they awake; and if the hour of its commencement were delayed and the night staff kept on duty for that purpose, the whole of the day's work would be shifted on a corresponding number of hours. In that case, much of the day work would have to be hurried through in order to complete it before nightfall, and among other evils many patients who at present get a good deal of sleep during the quiet hours of the afternoon would get no sleep at all, while no arrangements could be made for either the night staff or the day staff taking that outdoor exercise which is essential to both if the nursing of a

hospital is to be efficient. A desire to get the wards tidy before the doctors pay their visits has very little, if any, influence on the matter. Some doctors visit their wards in the morning, some in the afternoon, all alike arranging their work chiefly from the point of view of what is the best system of correlating all the various forms of labour essential to success in hospital undertakings. Early hours at hospitals seem practically inevitable, but what is not inevitable is a custom to which our correspondent does not allude, though where it exists it is at least as important a factor in depriving patients of sleep as is the commencement of the day at 6 a.m., or thereabouts. This is the practice of putting in wards for adults one or more cots for babies or small children. Though children learn to "be good" in hospitals very quickly, there are times when practically all of them are fractious either by day or by night, and the disturbance they thus create is often bitterly resented by patients, especially those in women's wards.

NURSING IN GERMANY.

JUDGING from a paper on overstrain among nurses read by Professor Hecker of Strassburg at the recent International Congress of Nurses, the organization of nursing is not one of those things which are better done in Germany than in these islands. According to this authority, as reported in the *British Journal of Nursing*, a normal day's work for a nurse in a German hospital is from eleven to thirteen and a half hours, not including meal times, while the pay ranges from £14 15s. a year to £25 a year after ten years' service. When on night duty they have under their charge from 30 to 40 patients, and are not infrequently expected to do domestic work as well as nursing. The hours for probationers are just as lengthy, and they receive their instruction in "off duty" time—that is to say, at the end of a long day's work—and they are frequently put on night duty after three or four weeks' experience. They are usually bound to serve the hospital for a definite number of years, but there is no fixed period of training. The term "certificated" is protected by the law, however, and can only be used by nurses who have passed the State examination, which should usually be passed at the end of the first year's work. The net outcome, according to Professor Hecker, is a great deal of overstrain among German nurses and excessively high mortality and invaliding rates. Some statistics quoted by him on this point showed that among 35 nurses who died in 1910, the deaths of 6 were due to heart disease, of 7 to tuberculosis, and of 9 to suicide. The last official statistics of the Red Cross Society told the same tale, 30 per cent. of 1,562 certificated nurses being invalided, and 52 per cent. of 329 probationers. The high mortality from tuberculosis he ascribed largely to poor food, lack of outdoor exercise and recreation, and to the effect of the long hours of nursing being aggravated by domestic service being demanded in addition. Professor Hecker's statements, it should be noted, were subsequently upborne by a paper read by the Matron of the Municipal Hospital at Dortmund. The discussion ended in a resolution drawing attention to the evil effects of overstrain, and begging hospital authorities to give the same consideration to the problem of overwork among nurses that industrial leaders are giving to the same question among other workers. It was further decided that copies of this resolution should be sent to the Home departments of the Governments of all countries whose nursing organizations are affiliated to the International Congress.

EMETINE IN AMOEBIC DYSENTERY.

THE conclusions as to the value of emetine in the treatment of amoebic dysentery, stated in the paper by Professor Leonard Rogers in the JOURNAL of August 24th, are receiving ample confirmation by other observers, and the drug is being very freely tested with most satisfactory results in Indian hospitals. His statement that the extraordinary rapidity with which, in cases of amoebic dysentery, very marked improvement follows the subcutaneous injection of emetine in doses of half a grain is of the greatest diagnostic importance, since cases of bacillary dysentery and other amoebic cases in which blood and mucus are present in the stools are not materially affected by the drug, is also being generally confirmed. This would appear to solve a great practical difficulty in dealing with dysenteries in the tropics. On the other hand, proof is accumulating that every amoeba in the body is killed by the drug. Time is yet too short to allow any certain conclusions to be drawn as to the prevention of relapses.

THE HUXLEY LECTURE.

THE Huxley Lecture will be delivered at Charing Cross Hospital Medical College on Thursday, October 31st, by Professor Simon Flexner, of the New York Rockefeller Institute. The subject he has chosen is Recent Advances in Science in relation to Practical Medicine. On these advances Professor Flexner is from his own researches pre-eminently qualified to speak. We may recall that the previous lecturers have been Professor Virchow, Lord Lister, Professor Welch of Johns Hopkins University, Baltimore, Professor Pavlov of St. Petersburg, Sir Patrick Manson, Sir William Macewen, and Dr. F. W. Mott. It may also be mentioned that on the same day the extensive new laboratories of public health and bacteriology, recently formed by the school and taken over by the University of London as the public health and bacteriological departments of King's College, will be formally opened and handed over to the university. The laboratories will be thrown open on that day to visitors. Further details as to this important event in the history of all the institutions concerned will be found at p. 825.

MRS. RADCLIFFE CROCKER has made a gift of £1,500 to University College Hospital to endow a travelling scholarship in memory of her husband, the late Dr. H. Radcliffe Crocker, for thirty years physician to the hospital, and at one time President of the Dermatological Society, and Treasurer of the British Medical Association. The scholarship, which carries with it a gold medal, will be awarded every five years.

A MEMORIAL to Lord Lister is to be established at University College Hospital, where the great surgeon received his medical training. A special committee has been formed, of which the Duke of Bedford, President of the Hospital, is Chairman, Sir John Tweedy being Honorary Treasurer of the fund. The exact nature of the memorial will depend on the amount of the subscriptions received, but it has been suggested that either a bust or a tablet should be placed both in the hospital and in the college. Only those who have been in some way connected with University College or the hospital are invited to subscribe.

THE first Italian Congress on the history of medicine and natural science will be held in Rome in October (11th to 14th).

AN international collective inquiry into the nature of ozaena is being made. The results will be communicated to the International Congress of Laryngology, to be held at Copenhagen in 1915.

THE Gresham Professor of Physic, Dr. F. M. Sandwith, will give four lectures at the City of London School, Victoria Embankment, on the relief of the sick and wounded in time of war, on October 15th, 16th, 17th, and 18th. The lectures, which are free to men and women, will begin at 6 p.m. on each day.

England and Wales.

[*FROM OUR SPECIAL CORRESPONDENTS.*]

MANCHESTER AND DISTRICT.

Sanatorium Benefit in Salford.

It was announced at a meeting of the Salford Insurance Committee, held last week, that the scheme for sanatorium benefit already described in the British Medical Journal had been submitted to the Insurance Commissioners, who had approved of the following items for a period of six months:

(1) The medical officer of health to act as temporary medical officer to the Insurance Committee. (2) A tuberculosis specialist to be employed at an agreed fee in cases where there was need for his services. (3) The arrangements for hospital treatment at the Drinkwater Park Hospital and for sanatorium treatment at the Crossley Sanatorium were approved, provided that these institutions receive the approval of the Local Government Board. (4) The arrangements proposed for domiciliary attendance were approved, provided that the treatment conforms with the orders of the Local Government Board. (5) The proposals about dispensary treatment were also approved, subject to the approval of the Local Government Board.

The medical officer of health estimated that the cost of the dispensary for the first twelve months, in addition to capital charges, would be about £1,300, and the Insurance Committee agreed to pay to the Corporation £350 for the use of the dispensary for the first six months. It was also agreed that the Committee should pay the Corporation 30s. a week per patient for treatment at the Drinkwater Park Hospital, but it was understood that the scale of payments would be revised in six months.

It was reported that the Honorary Secretary of the Salford Provisional Medical Committee had written, saying that if the Joint Committee of the Health and Insurance Committees would submit the scheme to the Provisional Medical Committee "for consideration and subsequent joint discussion with a view to amendment where necessary," members would be nominated for the purpose, but in the meantime until that were done no useful purpose would be served by any deputation. In reply to this the Insurance Committee directed a letter to be sent to the Provisional Medical Committee stating that the Insurance Committee "sees no reason why the draft scheme for sanatorium benefits should be submitted to the Salford Provisional Medical Committee for their consideration and amendment, having regard to the fact that the Committee has complied, as far as local conditions made it practicable, with the resolutions of the British Medical Association." It now remains to be seen whether the approval of the Local Government Board referred to above will be given in face of the letter sent to the Board by the Provisional Medical Committee, an extract of which was given in the Journal last week. The letter of the Insurance Committee begs the whole question, for it is the one great contention of the Salford practitioners that the scheme does not accord with the resolutions of the British Medical Association as far as practicable.

LONDON.

The Insurance Act.

The Clerk of the County Council announces that the machinery for providing sanatorium benefit (which includes institutional, home, and dispensary treatment) for insured persons in London is now in working order, and that already a number of applicants have been sent to sanatoriums or given dispensary and domiciliary treatment. In all, about sixty applications have been received, and of these about thirty-one have been dealt with in some way. It is added that, extensive as are the existing voluntary agencies for dealing with tuberculosis, several of the cases holding out the most hopeful promise of a complete recovery would probably not have been dealt with in ordinary circumstances until the disease had reached a stage which would have precluded any chance of a permanent restoration to health.

With a view to the better organization of the work, and reducing the cost of administration as far as possible, the London Committee has appointed a temporary sanatorium subcommittee for the cities of London and Westminster, and for each metropolitan borough. After applications had been duly inquired into, and the necessary examination and reports made, the committee, acting on the advice of its expert adviser, decided as to the treatment to be accorded to each case. If this is to be institutional, the necessary arrangements are made by the committee. If dispensary or domiciliary treatment is considered advisable, the case is remitted to the proper local subcommittee to be dealt with. In all instances the metropolitan borough councils have consented to their medical officers of health serving as members of the subcommittees. All the borough councils have also allowed their buildings to be used for the meetings of the subcommittees, and have given other facilities for furthering the objects of the Act in the direction of allowing their offices to be used in connexion with the giving of information to insured persons in the locality, the obtaining of forms of application for benefit and otherwise. These subcommittees establish a link with the central organization of the committee, which is likely to prove of great value in securing the efficient administration of the Act in London on the lines most calculated to be of benefit to insured persons. It is hoped that they will form the nucleus of the district committees which, under the Act, will have to be shortly appointed for each metropolitan borough and for the cities of London and Westminster.

The committee is now engaging the necessary staff for carrying on the work, for which they propose at an early date to secure suitable offices in a central part of London; meanwhile, applicants for sanatorium benefit, who, according to instructions issued by the Insurance Commissioners, must be insured persons who were in employment on or subsequent to July 15th, 1912, can obtain the necessary forms from the Acting Clerk of the London Insurance Committee, County Hall, Spring Gardens, S.W. These forms can also be obtained at the respective town halls of the metropolitan boroughs. The committee is giving close attention to the organization of the other duties devolving upon it under the Act, to ensure that there shall be no delay in providing the further benefits, so far as the committee is responsible therefor, immediately they come into force.

Compulsory Notification of Whooping-Cough.

The Lambeth Borough Council proposes to apply to the Local Government Board, under Section 56 of the Public Health (London) Act, 1891, for an order to make whooping-cough a notifiable disease for a period of five years. The annual deaths from whooping-cough in Lambeth were for the two decennia 1891–1900 and 1901–10, 143 and 93 respectively, the annual morbidity from the disease being in the same proportion. Dr. Priestley, M.O.H., has expressed the opinion that to obtain the maximum benefit from the removal of patients suffering from whooping-cough to hospitals, under the new order of the Local Government Board, compulsory notification of the disease is essential.

Ireland.

[*FROM OUR SPECIAL CORRESPONDENTS.*]

Local Government Board Report.

The annual report of the Local Government Board for Ireland for the year ended March 31st, 1912, which has just been published, contains particulars concerning the administration of the Poor Laws and the public health. On March 30th, 1912, there were in workhouses in Ireland 38,100 persons; 14,735 were in hospitals or infirmaries, 10,956 were aged or infirm, 2,313 were lunatics, idiots, or epileptics, and 5,097 were children under 15. On the other hand, there were 2,569 children at nurse or boarded out; 1,555 children under 15 died in workhouses during the year, of whom more than half were under one year of age. The total number of deaths in workhouses was 10,084, and of these over fourteen hundred were due to phthisis. There are still ten workhouses where there is no trained nurse. The new cases attended by dispensary medical officers under the Medical Charities Act numbered 652,778, and 77,379 vaccination or revaccinations were performed. The salaries paid to dispensary officers amounted to £104,196. There are now eighty-three unions

in which scales of salaries for the medical officers have been adopted. Tuberculosis is notifiable in only forty-one sanitary districts. In 284 out of 309 sanitary districts steps have been taken to carry out the provisions of the Dairies, Cowsheds, and Milkshops Order.

Peamount Sanatorium.

An open-air meeting was held last week at Newcastle, County Dublin, for the purpose of opposing, on behalf of residents of the districts, the establishment of a sanatorium at Peamount. The following resolution was adopted with one dissentient:

> Resolved: That this meeting, representative of the people of Rathcoole, Saggart, Newcastle, Celbridge, and Hazelhatch districts, protest in the strongest possible manner against the erection of a sanatorium at Peamount. Furthermore, that we strongly condemn the action of the Kildare County Council and Kerry County Council in taking beds in the said sanatorium, and we call upon the said county councils to rescind their resolutions binding themselves to do so, and we urge the other county councils to refuse any support to the proposed sanatorium.

Cork Board of Guardians.

At a recent meeting of the Cork Board of Guardians the following motion was proposed, but rejected by a majority of votes:

> That, inasmuch as the Chairman of the Board, on receiving notice of motion to increase the salaries of Drs. Morrissey and O'Connor, was not then aware, nor was he made aware, that they were appointed at a maximum salary of £100 a year, and as it was and is notorious that they are not now wanted at all, as never before were there more than two visiting doctors, now there are five visiting doctors, with 357 less inmates, therefore I move that the Local Government Board be made aware of the omission, and that they be requested to declare that the resolution passed granting them big advances be declared null and void.

Since then the Local Government Board has written to the Board of Guardians stating that it cannot allow any increase in the salaries of the doctors mentioned, as it was agreed when the appointments were made that £100 per annum was to be the maximum salary for these officers.

Scotland.

[FROM OUR SPECIAL CORRESPONDENTS.]

Zoological Gardens in Edinburgh.

At the recent meeting of the British Association in Dundee, the President of the Zoological Section, Dr. F. Chalmers Mitchell, Secretary of the Zoological Society, Regent's Park, in the course of some remarks on zoological gardens and the preservation of fauna, said that he hoped that the efforts of the Zoological Society of Scotland would be successful, and that before many months are over there will be a zoological park in the capital of Scotland. There is, he said, no reason of situation or of climate to be urged against it. The smoke and fog of London are much more baneful to animals than the east winds of Edinburgh. The gardens of North Germany and the excellent institution of Copenhagen have to endure winters much more severe than those of Lowland Scotland. The Arctic winter and tropical summer of New York form a peculiarly unfortunate combination, yet the Bronx Park of New York is one of the most successful menageries. The Zoological Society of Scotland will have the great advantage of beginning where other institutions have left off; it will be able to profit by the experience and avoid the mistakes of others. The Zoological Society of London would welcome the establishment of a menagerie in Scotland for scientific and practical reasons. When a dealer in the tropics has rare animals to dispose of he must send them to the best market. In Great Britain there are very few possible buyers, but in Germany one or other of the twenty gardens is almost certain to absorb them, and, failing Germany, Belgium and Holland are near at hand. The second practical reason was that it was a great advantage to have easy opportunities of lending and exchanging animals; for it often happened that as a result of successful breeding or of gifts on the one hand, or of deaths on the other, a particular institution was overstocked with one species or deficient in another.

Administration of Scottish Asylums.

Dr. A. R. Urquhart, the Physician Superintendent of James Murray's Royal Asylum, Perth, in the course of his report for the year ending March 31st, 1912, says:

> Scottish lunacy law was formulated in 1857 with such conspicuous wisdom that little has been required in the way of amendment ever since. Minor alterations have been noted as desirable of late years, and these have been embodied in a bill, introduced by Lord Pentland, which has met with general approval. Certain proposals, however, are apparently inimical to the interests of Royal asylums, and have been discussed at a congress of directors and physicians held to protect these interests. There are other bills which threaten disaster to the Royal asylums of Scotland. The district asylums were lately provided with pensions, thereby putting them on an equality with similar institutions in England and Ireland. No sooner had this become law than an amending Act is threatened, which reduces those hospitals for mental diseases to the level of factories in respect of hours of work. The Royal asylums require no such enactment; nor, indeed, do the district asylums. However suitable that may be for the vast asylums of London and Lancashire, it is unnecessary and adverse to the interests of patients and staff in every asylum in Scotland. Presumably the bill does not seek directly to affect the Royal asylums, but it is to be hoped that any such Act shall not apply to Scotland.

The Bishop's Well, Glasgow Royal Infirmary.

In the course of the reconstruction work at the Royal Infirmary a well which may prove to be of considerable antiquarian interest has been discovered. The Master of Works, in a report, states:

> We have come across what we believe to be the Bishop's Well, which is immediately under the entrance steps and arched over with concrete, about 5 ft. square, lined on two sides with oak boards. This well has been filled in to within a few feet from the top, and a brick wall built at the south side, forming a "sump" to catch surface water and probably land drains, and a pipe sewer put in to drain the water away. The iron pump now standing at the east side was fixed originally, in my opinion, to remove the water out of the well—hence the brick wall to save this trouble.

The Bishop's Palace is known to have existed as a stronghold as early as the thirteenth century. The ruins were cleared in 1792 for the erection of the Royal Infirmary.

Another discovery was made in demolishing the front or oldest block of the infirmary, which it was originally argued should be left untouched, being an example of work which should be preserved. It has now been found that it was in an unstable and dangerous condition. The block was designed by the Brothers Adam, and was erected between 1792 and 1794. It had a massive and elegant appearance, and was greatly admired as an example of the work of its designers. In an official report to the managers of the infirmary, Mr. John Woodward, master of works, states that the building was found to be in a very bad state of decay. All the centre portion, which has the appearance of very heavy masonry, was really a skeleton, and had to be shored up to prevent a serious mishap in removing. The pediment face, which was nearly all cement, it was impossible to save, parts of it crumbling away in the men's hands. Bond timber, originally built in with iron and lead straps, was the only thing that held it up, and a sample of the timber, which was completely decayed, showed the state the building was in. Mr. Woodward concluded his report by saying that it was a good thing the building was now being demolished, as something serious would certainly have happened.

The Law Relating to the Adulteration of Milk.

The difficulty of proving a conviction in a court of law against the seller of milk alleged to be adulterated is so great that in many places defaulters are not summoned. The basis of the law relating to milk adulteration is to be found in the Sale of Foods and Drugs Act, one of the sections of which makes it an offence to sell, to the prejudice of the purchaser, any article of food which is not of the nature, substance, and quality of the article demanded by the purchaser. As the statute, however, did not indicate any standard for any particular kind of food, there was difficulty in applying the Act to the case of milk. This resulted in the passing of the amended statute in 1899, which conferred on the Board of Agriculture the power of making regulations for determining what deficiencies in or additions to genuine milk should raise a presumption that the milk was not genuine. In

1901, adulteration, in the case of milk, was defined to mean "the abstraction therefrom of milk fat, or the addition thereto of water." In 1901, shortly after the regulations were issued, a case came before the Court of Appeal in England—Smithies *v.* Bridges—which was not based on the regulations, but on the general statutory rule. The magistrates found that though the milk there in question had come direct from the cow it was not of the nature, substance, and quality of milk, and convicted the milkseller of adulteration. In the course of the argument in the Appeal Court, the regulations and the comments of the majority of the judges were on similar lines to those expressed by the Lord Chief Justice in the following words:

As to the recent Order of the Board of Agriculture, I do not think it purports to set up a standard of what is or what is not genuine milk, but only means to say that the want of a certain percentage of fat is to be prima facie evidence that the milk is not genuine. It will still be open to the defendant to prove that the milk is genuine. If, however, the article produced, though it is produced by the cow, is the result of an abnormal condition of things arising either from disease or, as here, from the unusual treatment of the cow, I think that that does amount to evidence on which the magistrates can find that the article is not of the nature, substance, and quality of the article demanded.

That opinion, given in 1902, influenced greatly the practice of the authorities who were charged with carrying out the regulations. It gave them ground for arguing that if milk was found to be below the standard set in the regulations, that was clear proof that it was not the milk of normally healthy cows fed in a normal manner. Convictions followed on proving a breach of these regulations. Since the hearing of a case in the Court of Session and the decision of a bench of seven judges in the recent case of Scott *v.* Jack, the state of matters in Scotland has been radically and definitely changed. There it was proved in evidence, and was prominently before the Court, that:

The cows were Ayrshires and crosses, and were selected by the respondent as likely to yield a large quantity of milk. Respondent fed the cows so as to produce the largest yield of milk, and paid no attention to the quality.

The cows were in a fair condition and appeared healthy. The milk in question was deficient in milk fat 14 per cent., and in milk solids 11 per cent., but it was proved that it had not been tampered with or adulterated, but was sold in the same condition as yielded by the cow. Had a breach of the regulations been committed? In finding that there had not, the Court unreservedly threw over the theory of Smithies *v.* Bridges and refused to convict. To show that the judgement was given on the broad question, the following observations by Lord Mackenzie may be quoted:

The case is intended to raise the general question whether milk may not be genuine though there has been no abstraction of milk fats or milk solids and no addition of water; that is to say, whether a man who sells sweet milk in an unaltered state can be convicted of selling what is not genuine milk, the deficiency being due to an improper method of feeding purposely adopted to produce quantity, irrespective of quality. In my opinion it cannot.

In this opinion the other judges concurred. The importance of this decision is very great. Milk prosecutions will probably now become rare, because unless proof of actual tampering with the milk can be brought, it will be useless to summon the milkseller, for the respondent has only to prove no alteration and he escapes; and in virtue of the judgement of the Court of Session last year (Lamont *v.* Rodger) he can prove this by testimony of himself and his family or servants.

The Health of Glasgow.

The annual report for 1911 by the Glasgow Medical Officer of Health is a voluminous but interesting document of 157 pages, with fifty-three pages of appendix and numerous charts and plans. It gives a comprehensive review of the health administration of the city, and while there are many points for congratulation, there are also notes of warning and regret. While the general death-rate is lower, there are districts with abnormally high rates. The problem of congested areas has not been relieved by the extension of the city, which has involved the absorption of new congested areas, and here a note of warning must be sounded. Infantile mortality is lower, but the birth-rate is the lowest on record.

Infant Mortality.

During the year 21,755 births were registered, of which 21,584 properly belong to the city. This represents a birth-rate of 27.513 per 1,000 persons living, as compared with 27.642 in 1910. The deaths from all causes were 13,899, or a rate of 16.44 per 1,000 as compared with 15.66 in 1910. But, except 1910, the lowest rate recorded was 17.58 in 1906. The deaths of infants under one year numbered 2,944, equal to a death-rate of 136 per 1,000 births. This is 17 per 1,000 above the rate for last year, which was the lowest on record. The increase is attributed to the high temperatures which prevailed in the summer and autumn of 1911, but there is evidence of improvement when viewed over a series of years. The diseases contained in the group "immaturity" constitute the largest individual portion of the infant death-rate, and represent a mean rate of 46 per 1,000 male births and 37 per 1,000 female births. Under existing circumstances this is to be regarded as an irreducible part of the infant death-rate—irreducible at least until the causes, which prejudicially affect gestation, are better known. There is some reason for thinking that among the poorest of the population the proportion of fat and carbohydrates in their dietary is insufficient. The death-rate among male infants is uniformly in excess of that among females, the total rate for the former being 145 per 1,000 births compared with 120 for the latter. This feature is reflected at every age period save from 25 to 35 years, when the rate among females exceeds that of males, and suggests that the higher death-rate obtaining among adult males are sex differences, and not wholly due to exposure and the exigencies of employment to which they are usually ascribed.

Next in frequency to immaturity are the diseases of respiration which show a mean rate of 31 and 25 per 1,000 male and female births respectively. During 1911 births numbering in all 171 were recorded in twelve private lying-in houses. Most of these children are illegitimate, and immediately after birth are handed over to the care of foster-parents. All such births are reported to the parish authorities, who keep careful supervision over the children, but the medical officer of health raises the question whether these houses should not be registered and put under supervision, either of the Public Health or the Poor Law Authorities.

Infectious Diseases.

During the year 28,157 cases of infectious disease were registered and dealt with by the department. This represents an attack-rate equal to almost 36 per 1,000 of the population, which is 2 per 1,000 less than the rate for 1910. Of the total cases registered, 9,181, or 32.6 per cent., were treated in hospital. The attack-rate for the notifiable diseases for the city as a whole was slightly over 10 per 1,000, as compared with almost 26 per 1,000 for the diseases which are not notifiable. Of the notifiable diseases 4 per 1,000 is due to scarlet fever, almost 3 per 1,000 to phthisis, and 2.4 to diphtheria. Upon this subject the Medical Officer of Health makes the following general observations:

Scarlet fever and diphtheria were again pretty generally distributed throughout the year, although there was evidence of a lessening in the prevalence of the former, as compared with the two preceding years. The attack-rates for diphtheria and enteric fever were practically the same as in the previous year. In phthisis there is a conspicuous reduction. This is not accounted for by diminution in the actual number of persons attacked by the disease, but by the fact that compulsory notification was introduced at the beginning of 1910, and in consequence a large number of cases which had been attacked in previous years came upon the books for the first time. The attack-rate of 3 per 1,000 shown for 1911 may be taken as representing more accurately the incidence of the disease.

Small-pox in Scotland.

During last week there was an outbreak of small-pox in Kirkcaldy (Fifeshire). In all ten patients were removed to the small-pox hospital, of whom three have died, while the remaining seven are going on well. All the cases which had been in contact were under observation, and so far have manifested no symptoms of the disease. The supposition is that the cases were due to Russian flax infection; but that will, doubtless, be more fully investigated by the local authorities and by the Local Government Board. On September 23rd the Kirkcaldy Town Council passed a resolution that the Infectious Diseases (Notification) Act, 1889, should apply to chicken-pox for the space of one month.

India.

[FROM OUR SPECIAL CORRESPONDENTS.

THE REORGANIZATION OF THE SANITARY DEPARTMENT.

ANOTHER resolution of the Government has been issued defining the functions and duties of the Sanitary Commissioner with the Government of India under the new arrangements, whereby that officer is once more subordinated to the Director-General of the Indian Medical Service. The resolution states that the former complete separation of the two departments and the placing of the bacteriological officers under the Sanitary Commissioner led to an undesirable divorce between scientific and sanitary work, and rendered the bacteriological branch unpopular, while leaving the Sanitary Commissioner too little time for touring and inspections. After reference to the Secretary of State and local governments, the appointment of Sanitary Commissioner has been revived on the former pay, but subordinated to the Director-General, and relieved of the control of the bacteriological department, which will return to the charge of the head of the medical service. The Sanitary Commissioner will thus be in the position of a staff officer to the Director-General, but will have independent authority in technical sanitary matters, with power to correspond directly with local governments. In order to relieve him of as much routine work as possible, the two offices will be re-amalgamated, and the statistical officer will become a secretary of the sanitary section under the Director-General. The Sanitary Commissioner will in future be able to tour freely and regularly throughout India, inspecting and advising on sanitary works and schemes. He will find ample scope for his energies in regard to the important schemes of improved urban sanitation, for which grants are being given by the Government of India to the various provinces, and in the antimalarial measures which are being actively pushed on. Altogether the new arrangement appears to be an important advance on the previous conditions.

LADY HARDINGE'S SCHEME FOR A MEDICAL COLLEGE FOR WOMEN IN INDIA.

From a recently issued press note it appears that in June last His Highness the Maharajah of Kotah (Rajputana) offered a lakh of rupees to Lady Hardinge in commemoration of the Royal visit to India, to be spent for the benefit of the women of India. Her Excellency has decided to make this sum the nucleus of a fund for founding at Delhi a medical college and hospital for women, to be called the Queen Mary Medical College and Hospital. The urgent need for such an institution is due to the difficulty in getting enough of the better-class Indian women to take up the medical profession owing to the fact that they can at present only receive instruction in men's colleges and in mixed classes. The idea has been generously taken up by other Indian chiefs, and already half of the necessary fifteen lakhs has been promised.

DELHI HOSPITALS.

The hospital arrangements in temporary Delhi have now been finally settled. The General Hospital for Europeans will be established in Hindu Rao House and the Hospital for Indians in Balak Ram-ki-Kothi, while a small hospital for infectious cases will be built on the Durbar area somewhere near Kingsway. For the present these hospitals will be placed under the charge of Major Ogilvie, I.M.S., who has succeeded Captain Ward, I.M.S., as special medical officer at temporary Delhi.

MEDICO-LEGAL WORK IN THE CALCUTTA MORGUE.

Captain O. St. John Moses, I.M.S., Police Surgeon of Calcutta, and Professor of Medical Jurisprudence, Medical College, Calcutta, has issued in pamphlet form a review of a year's medico-legal work in the Calcutta Morgue for 1910 and 1911. These papers appeared in the *Indian Medical Gazette*, August, 1911, and June, 1912.

Dealing with the year 1910, 283 cases were sent up by the police for *post-mortem* examination, as cases in which death appeared to occur under more or less suspicious circumstances. Of the cases dealt with, 185 were males and 98 females. It is noted that Hindus numbered 196, Mohammedans coming next, 45; Europeans 13. The table giving the number of cases according to age-periods shows that between 20 and 35 years was the most frequent.

Of the viscera preserved at the time of the *post-mortem* examinations, 175 were sent to the Chemical Examiner to Government for examination and analysis. Captain Moses has introduced the plan of preserving the viscera in the usual manner, and with the usual precautions in all cases. In instances where there are evident signs of poisoning, or where, on the other hand, although no naked-eye appearances of poisoning are present, the police report points to a possibility of some poison having been used, or when a suspicion arises owing to the absence of manifest cause of death, the viscera are dispatched at once to the Chemical Examiner. If, however, death is found to be clearly due to natural causes, or if the unnatural cause (being other than poison) is quite obvious, and there is at the same time the suspicion of poisoning in the police report or in the *post-mortem* appearances, the jar containing the viscera is preserved. The viscera are retained pending advice from the Commissioner of Police either for destroying after disposal of the case judicially, or for forwarding to the Chemical Examiner.

In the cases examined by the Chemical Examiner, opium heads the list of poisons. Out of 83 cases, 47 were of opium poisoning, alcohol in 13, morphine in 5. It is stated that in 72 per cent. of all the opium cases the drug was used for the purpose of suicide. Violence in some shape or form accounted for 192 deaths, 74 being from accident, 67 being suicide. Natural causes accounted for 91 of the cases in which a *post-mortem* examination was made.

The figures for 1911 show that 356 cases were sent up for *post-mortem* examination—272 males and 84 females—Hindus again heading the list, 236 as against 62 Mohammedans, who come next. Poison was found in 72 out of 133 cases examined, and, as in 1910, opium maintains the first place, 40 cases; but of 211 deaths by violence, 90 were by accident, 78 suicidal, and 14 homicidal. Comparing the two years under review, it is that the total number of suicidal (violent) deaths in 1911 was somewhat in excess of that of 1910—78 as against 68—as also was the figure for suicidal deaths by means of poison alone—47 in 1911 against 43 in 1910. Poisons take the lead, opium being the favourite means of self-destruction, while hanging comes second, and accounts for 24.3 per cent. of all suicidal deaths.

HEALTH OF THE PUNJAB.

The general healthiness of the Punjab in 1911, which had its effects on the sanitary administration of the province, was naturally not without influence on the figures of attendance at the various dispensaries and charitable institutions. The number of persons treated showed a marked diminution, principally under the heading of malaria, where the reduction in patients amounted to 200,000. At the same time the proportion of females amongst in-patients increased, and the Lieutenant-Governor in his review of Colonel Bamber's annual report on the working of the dispensaries, etc., expresses satisfaction at this circumstance, and at the progress made in providing separate treatment for women patients. It may be noted that there are twenty-five dispensaries reserved for female patients, all but seven of these being "private aided" institutions. The returns show that they are all very popular. Sir Louis Dane suggests that more of these institutions might be maintained by municipalities and district boards, although the scarcity of female assistant surgeons to take charge of them is a difficulty at present. However, with the facilities for training now offered at the Northern India School of Medicine, as well as at the King Edward Memorial College at Lahore, the number of qualified women is certain to increase in the near future. The total number of dispensaries at work in the province underwent a net increase of one during the year, owing to two private institutions being closed, while three local fund ones were opened. The local funds in the twenty-nine districts of the Punjab support in all 266 dispensaries, and in addition there are the dispensaries at district and tahsil head quarters and at all towns of any size, while for several years past plague officers on tour have carried with them camp dispensary equipment. His Honour is in favour of opening Canal dispensaries to the general public, but nothing is said on this subject in Colonel Bamber's report. During the year under review the much discussed

experiment of charging fees to well-to-do patients was tried without materially reducing the attendance at the dispensaries. Except in the case of mission hospitals, it is noteworthy that private subscriptions play an almost negligible part in the maintenance of hospitals and dispensaries, the expenses of which are met entirely by municipalities, district boards, and Government. His Honour is of opinion that more money would be forthcoming from private persons if it were known that their subscriptions would be devoted to some special improvement which could not otherwise be afforded.

Health of Simla.

Considering the congestion that still exists in some of the wards the health of Simla is remarkably good. Excluding the deaths among children under 1 year of age—130 out 413 born—the rate of mortality last year was low. Epidemic disease was not prevalent, and the enteric cases dropped from 33 to 21, of which 11 were imported. Bad drainage and insanitary kitchens were detected in some instances, and it is remarked in the annual municipal report just published:

> The policy of condemning, whenever opportunity offers, insanitary buildings or parts of buildings, continued during the year, and when sanctioning construction or reconstruction the committee laid down the necessary conditions to secure light and air, not only for the new houses but also for adjacent ones. Improvement thus slowly spreads over the congested areas.

The water supply in the summer months works out to about 13 gallons per head daily, and this will be increased next year when the hydro-electric scheme comes into operation. More sewerage and drainage works are needed in the station, but at present all that can be done is to maintain in good order those that are already in existence.

Allahabad Water Works.

At a meeting of the United Provinces Sanitary Board it was decided to grant Rs. 30,000 to the Allahabad Municipality for the repair of the pumping engines, and Rs. 50,000 to the Mirzapur Municipality for the completion of the water works.

Light and Air in Bombay.

The Bombay Government has appointed a committee to examine the questions raised in a lecture given by the Hon. Mr. J. P. Orr on the subject of light and air in dwellings in Bombay. The Bombay Corporation has been asked to select two members to serve on the committee.

Sanitation in the United Provinces.

Sir John Hewett presided over the last meeting of the United Provinces Council before his near approaching retirement. After no less than ninety-seven questions had been answered, two bills were passed—namely, the Village Sanitation (Amendment) Bill of 1912, and the Prevention of Adulteration (of Food and Drugs) Bill, 1911.

Treatment of Snakebite.

In his report on dispensary returns for 1911, the Inspector-General of Civil Hospitals, Eastern Bengal and Assam, writes:

> In 1911 only 14 cases of snakebite were treated with Dr. Rogers's or Sir L. Brunton's lancets and permanganate of potash—namely, 4 in the Lushai Hills, 3 in Sylhet, 2 each in the Khasi and Jaintia Hills and the Naga Hills, and 1 each in Darrang, Goalpara, and Rangpur Districts. Of these 12 were males and 2 were females, and their ages varied from 14 to 50 years. In the 2 cases treated at Shillong in the Khasi and Jaintai Hills the snakes were identified by the civil surgeon as *Lachesis monticola*, but they were very small—6 in. and 8 in. in length—and the punctures were only skin deep. In the remaining 12 cases, in which the snakes were not identified, the constitutional symptoms and local effects showed that in 7 the snakes were probably non-poisonous, in 3 slightly poisonous, and in 2 poisonous (1 deadly). Of these 14 cases treated, 1 died. The treatment with incision by Rogers's lancet and potassium permanganate applied locally was apparently of use in some cases, but proved of no avail in a case supposed to be the bite of a cobra, though 2 ligatures were applied within three minutes and treatment with permanganate of potash begun in ten minutes, according to the report. I am of opinion that much good results from this method of treatment for snakebite, but the reports furnished are not dependable in many cases, as various details as to time between the bite and the application of a ligature, as also between the bite and commencement of treatment, depend on guesswork; the snake, too, is frequently not killed, and, when killed, not recognized.

New South Wales.

[FROM OUR SPECIAL CORRESPONDENT.]

Low Death-rate in New South Wales.

The Acting Government Statistician, Mr. H. A. Smith, states that the mortality-rate of New South Wales during the last fifty years has decreased by 37 per cent. Between the period 1861–70 the death-rate per 1,000 in New South Wales was 16.42. Last year it was 10.34 per 1,000. Even fifty years ago our death-rate was little higher than the present rate of the most healthy European countries, and to-day Denmark, the healthiest of them, has a considerably higher mortality than any of the States of the Commonwealth. The New South Wales death-rate for 1911 is stated to be 10.34 per 1,000. At all ages the New South Wales death-rate largely decreased during the past fifty years, slowly for the first thirty years, and rapidly during the last twenty. Mr. Smith says that in this there can probably be seen the influence of the Dairies' Supervision Act of 1886, the Diseased Animals and Meat Act of 1892, the Public Health Act of 1896, and, moreover, in the early Nineties an improved sewerage system was carried on after the transfer in 1889 to the present board of the old sewerage works. Over the whole period the fall for all ages was as much as 37 per cent. Up to the age of 35 the decline was over 50 per cent., namely: 67 per cent. at ages 5–9, 53 per cent. at ages 0–4, 53 per cent. at ages 10–14, 48 per cent. at ages 15–24, and 50 per cent. at ages 25–34. At ages 35–75 the fall was 48 per cent. in the first group and 20 per cent. in the last.

Birth-rate in New South Wales.

Mr. H. A. Smith has also prepared an interesting return dealing with the birth-rate. In a table the birth-rates per 1,000 of women living at various groups of reproductive ages, from 15 to 45, are divided into total births, legitimate and illegitimate, for the three census periods 1891, 1901, and 1911. In the case of mothers aged 15 to 29 the decrease per cent. in rate from 1891 to 1911 was 4.4; 20 to 24, 17.2; 25 to 29, 24.3; 30 to 34, 32.5; 35 to 39, 37.7; 40 to 44, 43.6. The general rate thus shows a slight advance in 1911 as compared with 1901; the rate for mothers over 30 years of age shows a regular decrease from period to period, from which it appears that the rate has been maintained only by births the result of recent marriages. A second table shows the legitimate births per 1,000 married women at each age. From this it will be seen that the rate at the youngest ages (15 to 19) has advanced, and that in 1911, although lower than 1901, it was higher than in 1891. From thence onward, however, as the age advances the decline has been general, amounting to 21.6 per cent.

Medical Inspection of School Children.

At the present time three doctors are employed as medical inspectors of school children in the metropolitan area and one in the Newcastle district. Circulars of instruction are issued to teachers, which enable them to detect cases of children who appear to be suffering from defects. Teachers then select the children who should be presented for examination by the doctor on his visit to the school. The doctor also makes a general inspection of the various classes, and selects any others who may have escaped the observation of the teachers. On ascertaining the presence of an ailment, he gives the child a note to the parent informing him of the fact and advising medical attention. He further reports on the condition of the school premises from a medical point of view. It is also one of the duties of the doctor promptly to visit a school where an epidemic breaks out, and take such action as may be necessary to prevent the spread of contagion. The anthropometric work for statistical purposes is confined to measurements of height and weight and to tests of vision. This is carried out by the teachers under instructions issued for the purpose. A new departure is now being made by the appointment of our nurses who are to work under the supervision of the doctors. The duties of these nurses are as follows: To attend school with medical inspectors; to take down at doctor's dictation medical directions as to ailments of children; fill in notes to parents with doctor's recommendation, and to dispatch them promptly by post; to keep a list

of all children whose parents have been advised as to ailment with a view to visiting their homes and urging compliance; to revisit the schools and ascertain from the list made out in the first instance if the doctor's recommendations have been adopted; to visit homes of those parents who have failed to carry out suggestions, and tactfully to urge compliance with the same; to take special cases to hospital or doctor whose parents are unable to do so; to carry out all other cognate duties such as the medical inspector may direct. In order that more time may be allowed to the doctors to carry out the medical inspection in the schools and the higher lecturing work, an additional nurse has been appointed to give courses of lessons to the senior girls in the schools on the care of infants, including the nursing, clothing and feeding of babies.

The Australian Death-rate.

Mr. G. H. Knibbs, the Commonwealth statistician, in the course of an address on Australian mortality during the last thirty years, stated that New Zealand was the only country in the world which had a lower death-rate than Australia. The Australian mortality had decreased from 13.0 per 1,000 in 1880 to 11.2 per 1,000 in 1896, and to 7.1 at the present time. It was noteworthy that whereas the mortality from tuberculosis had considerably decreased, that from cancer had correspondingly increased, until quite recently the number of deaths from cancer exceeded those from tuberculosis. Statistics showed, moreover, that whereas middle age was the time of life at which people most often died of tuberculosis, the mortality from cancer went on increasing with age. As regards suicide, Mr. Knibbs stated that, contrary to what might be supposed, it was possible to predict the phenomenon of self-destruction. In Australia the ratio of male to female suicides was very peculiar, for 495 men committed suicide to every 100 women. In Europe suicide occurred with greatest frequency in June, while in Australia they were most common in December; but in Australia the range of differences as between the seasons was less than in the Old World. The ratio between suicides and temperature was identical, so that it could be calculated from the temperature what the suicides would be. Usually there was an interval of nine to ten days between the period of greatest heat and its expression in the maximum of suicides. The tendency to suicide reached its maximum amongst males at 65, but among females it rose rapidly to 19, and then showed little further increase. The maximum of male suicides as at different ages was six times as great as the maximum of female suicides.

Juvenile Labour in Factories.

In the annual report of the Department of Labour and Industry, which has just been presented to Parliament, it is stated that since federation the number of factories in the metropolitan district had increased by over 100 per cent., and the hands employed therein from 34,225 to 77,505, and although the area of the district had been extended, this would not affect the increase to any considerable extent. The principal classes of industries which showed a substantial increase were clothing and textile fabrics, metal works, machinery, etc., processes in stone, clay, glass, etc., light, heat, and power, furniture, bedding, etc., and working in wood. The department has always been opposed to young girls in factories working overtime, and the provision in the Minimum Wage Bill (which was passed at the end of 1908) for tea money and overtime was intended to prevent the continuance of overtime by those employees. This appears to have been effective for a year or two, but since the latter part of 1910 there has been such an enormous increase in the work in various factories in which numbers of young girls are employed that a good deal of overtime has been worked by them. It is suggested that the only way to deal with this question is by legislation fixing the age at which females may be so employed. On the question of juvenile labour it is suggested that the age at which children should be allowed to commence work in factories should be raised to 15 years, but that provision should be made in regard to boys only, that where the Minister is satisfied that the boy is physically strong, is fairly well educated, and that his earnings would be of material assistance in the upkeep of the home, special permission to work in a factory at the age of 14 years should be granted. Overtime also should be forbidden in the case of any boy under 16 and any girl under 18 years of age.

Straits Settlements.

Annual Report of the Medical Department.

The report for 1910, which has just been received, is a lengthy document of over 150 pages, and deals with the different departments of the Public Health Service.

Population.

The population of the Straits Settlements for 1910 was 653,853, showing an increase of 8,931 on that of the previous year. The birth-rate for 1910 was 27.55 per 1,000, a slight increase on that of the previous year, which was 26.69. The death-rate for 1910 was 41.88 per 1,000, as compared with 37.58 for 1909; 5,077 of the deaths registered in 1910 were among infants under one year of age, which represents a percentage of 18.47 of the total. Of the 5,077 deaths registered of infants, 3,714 were returned as due to convulsions. With the hope of reducing the large infantile mortality a nurse was appointed in Singapore to instruct native mothers in the proper care of their infants.

Zymotic Diseases.

Only 5 cases of plague occurred within the municipal limits in Singapore, and all were in Chinese males. Two outbreaks of small-pox occurred during the year—in all 1,879 cases and 522 deaths, as compared with 41 cases and 8 deaths in the previous year. The number of cases of beri-beri remains much the same as in previous years, 2,044 cases being treated in hospital, with 290 deaths. In common with other countries where this disease prevails the results from the use of parboiled rice continue to be satisfactory. The native patients at the several hospitals are exclusively fed on it. The deaths from phthisis registered amounted to 2,571, as against 2,659 in 1909. The death-rate from malaria continues very high; there were in all 3,300 deaths in the whole of the colony. The chief cause of the great prevalence of this disease is the opening up and clearing of new estates in all parts of the peninsula. 280 cases of ankylostomiasis were admitted to the hospitals during the year, with 84 deaths.

Hospitals.

Full advantage is taken of the different hospitals throughout the colony, no less than 35,684 cases being treated in 1910, the percentage of deaths to total treated being 12.69. The principal diseases treated were malaria, beri-beri, phthisis, dysentery, and venereal diseases. There was a considerable increase in the number of vaccinations performed in the colony—20,990, compared with 12,854 in 1909.

Medical School.

Eighteen new students joined during the year for the full course of five years, of whom two were women, making in all 72 students in training for the L.M.S. diploma.

Lunatic Asylum.

The report refers with satisfaction to the fact that the percentage of insanity in the colony is considerably lower than in England and Wales. This percentage (based on the last census figures) is for the Straits Settlements 5.27 per 10,000, and 36.1 per 10,000 for England and Wales. The low percentage is attributed to there being an abnormal ratio of females to males, and so less puerperal insanity, abnormal number of very old and very young, little alcoholism, and the deportation of many of the partially insane, imbecile, and weak-minded to their own countries.

Leper Asylum.

Leprosy still continues to be prevalent in the colony, 191 fresh cases being admitted to the asylum during 1910, giving a total of 611 under treatment. There were 186 deaths.

Pathological Department.

During the year 879 specimens were examined. These specimens consisted of blood films from malaria cases and typhoid cases, sputum, urine, faeces, etc.

Meteorological Return.

The mean shade temperature in the different months varies very little during the year, 81.1° being the highest, and 79.5° the lowest, the mean daily range being about 14°. The total rainfall during the year amounted to 112.65 inches, the wettest month being February (which had a recorded rainfall of 22.31 inches), January, May, June, and July being the driest, with a rainfall of 6 inches.

Correspondence.

THE ORGANIZATION OF THE CAMPAIGN AGAINST TUBERCULOSIS.

SIR,—All over the country schemes are being considered and adopted for the control and treatment of tuberculosis in connexion with Sanatorium Benefit. In a few weeks we shall be in the thick of the fight again with regard to Medical Benefit, and the tuberculosis question will be likely to receive inadequate consideration, especially as all schemes now adopted are stated to be merely provisional. The main features of the provisional schemes are exceedingly likely to become stereotyped in the final arrangements, and it is, therefore, of urgent importance that two vital defects that tend to show themselves in many schemes under consideration should be carefully looked for and avoided. The one is a positive, the other a negative, defect.

The positive defect is the tendency to give an established place in the scheme to some particular form of treatment for the disease, either by making special provision for it, as being a form of treatment to be carried out by particular officers or at particular places, or by arranging special scales of payment for carrying it out. Such provisions are likely to find favour with the therapeutic specialist, whose chief work it is to carry out this particular sort of treatment, and who is naturally pleased to see prominence given to what he at the moment believes to be the most efficacious, and possibly the only true, method. They are also likely to find favour with those to whom the provisions assign the carrying out of this work, if it is not too arduous, or the payment for it, if it is sufficient. But to those who are interested in the general progress of scientific medicine any risk of stereotyping by official regulations any particular line of treatment which happens at the moment to be popular must be regarded with dismay. Most of us who are over middle age can remember large numbers of so-called specific methods of treating tuberculosis which at the height of their popularity were asserted to be the only infallible methods of cure, with as much confidence as are any of the specific methods at present in use, and which have nevertheless now rightly come to be regarded as having merely a limited use in particular cases. Whether they would so soon have found their proper place if they had been selected as authoritative methods for special regulations and special payments in a public scheme is more than doubtful. It is earnestly to be hoped that every doctor engaged in the fight against tubercle will be allowed "free choice of treatment" unhandicapped by any bias that may be imported by special regulations as to personnel, place, or payment.

The negative defect in many schemes is in my opinion of even greater importance. Insufficient attention is too often given to the supreme necessity of securing for every tuberculous person a "home doctor." In commenting on the Manchester scheme this week you, Sir, draw attention to this defect as a serious injustice to the general practitioner. But I would put it on the higher ground that it is a fatal bar to the efficiency of any scheme from the point of view of curing the patient or safeguarding the community.

The first step in any scheme should be to compel the tuberculous person himself to choose, and if he will not, to select for him a "home doctor." No form of treatment of any kind should be carried out until this is done, and whatever treatment is subsequently adopted should be done in co-operation with this practitioner. This home doctor should be continuously responsible for the supervision of the patient so long as he is residing in his home and should be kept informed of the progress of the case if removed for hospital or other institutional treatment. It is only by such constant supervision of home conditions that the arrest of tuberculosis in any individual case can be maintained, and that the large sums which it is now proposed to spend on the eradication of this disease shall be prevented from being frittered away.

No sanatorium scheme should be approved which establishes any form of specific treatment or fails to establish for each tuberculous person a home doctor.—I am, etc.,

London, Sept. 23rd. LAURISTON E. SHAW.

SIR,—Dr. McNeil shows again in his paper on "Tuberculosis in Infancy and Childhood" what has been shown time and time again, that a very large percentage of children, both under 5 and during school life, show a positive reaction to von Pirquet's test. This we find is the case, even though there may be no lesion at all, but each one of these children is a possible consumptive patient, and may become a focus of infection. Is not this fact a reason why more attention should be paid by the local education authorities to that part of the interim report which deals with children, and in which sanatorium and other schools are recommended?

The present so-called preventive measures being inaugurated by the various authorities are, to my mind, very incomplete, merely "shutting the stable door after the horse has been stolen." To destroy the tide of disease at its very start we must get at it in the children. The only effective method of rendering the next generation freer from the disease than the present one is to prevent the germs developing in childhood during school life, and at the same time to so develop their bodies that their resistive forces may overcome the ravages of modern life. The aim of the present crusade against tuberculosis should not be merely to obtain a reduced death-rate, but to stamp the disease out altogether, and to do this no half measures are of any avail.

The proper control of the milk supply is, of course, absolutely essential, but even when it is properly controlled there are still many other sources of infection; and if there are a great number of impaired constitutions and poorly developed bodies in the community, they will, of course, all be likely to be suitable media for the growth of the bacillus. If all children reacting to the von Pirquet test were deported out of the towns into country schools far away amongst the pines and heather, and if these schools were conducted on sensible, health-producing lines, not only would the nation be richer by having a growing generation stronger in physique, but also the slum children freed from disease, bad, unhealthy dwellings, and stupid, neglectful mothers, would be taught to appreciate their work in life, and how to do it well. Their brains and bodies would be developed at less cost and less energy on the part of the teachers than is the case now. Such schools properly controlled by resident medical officers, and conducted on very different lines to the modern council school, would not only, I feel sure, do more to stamp out tuberculosis than any other method, but also would help to solve many of the most pressing social problems of the day.

There are tremendous possibilities in these colonies. They would prove a means of regenerating the English race, of developing the national physique, of training the national brain into more normal grooves, of creating a healthy love of Nature and outdoor pursuits, and of creating a horror in the minds of all of dirt, foul air, filthy streets and dwellings, and all disease-infested neighbourhoods.—I am, etc.,

Salford, Sept. 23rd. PHILIP BENINGTON.

SIR,—Having noticed in past issues of the JOURNAL many instances of your keenness for correct nomenclature, might I venture to suggest that you once more have an opportunity of keeping the laity right, and of enlightening even the members of the medical profession?

Repeatedly in your recent issues, and also in the reports of the meetings of the State Sickness Insurance Committee, the term "sanatorium benefits" is used when the intention is to refer to a proposed tuberculosis medical service available for every member of the community in the United Kingdom. The words, "sanatorium benefits," have now become so closely associated with the National Insurance Act and certain peculiar benefits to be given

to insured persons only, with possibly an extension to their dependents, that to use them when referring to schemes for the whole community can only lead to confusion. This confusion was very marked at the recent Representative Meeting, when several of its members openly acknowledged their ignorance of facts by inquiring of the Chairman whether persons in the receipt of incomes of several hundred or thousand pounds a year, and not insured under the Act, could participate in the proposed tuberculosis schemes. It was the constant use of the words "sanatorium benefits" when a tuberculosis medical service was referred to which nearly placed the Representative Meeting in the untenable position of declining to assist schemes for combating tuberculosis throughout the United Kingdom for the whole community, even if all the cardinal principles demanded were granted, solely because a proportion of the required funds would come from the National Insurance Fund formed for only a third of the community and for whom it was proposed to give, in addition, a medical service for other diseases and complaints possibly on lines objected to by the medical profession.

Recent correspondence in the JOURNAL and SUPPLEMENT would lead one to suppose that the writers believed that the two medical services were interdependent and related. If it is appreciated that the proposed tuberculosis medical service is entirely separate in organization, conduct, and, so far as two-thirds are concerned, in *clientèle*, from the National Insurance Act and its medical service, and must therefore be judged entirely on its own merits apart from that Act, then the medical profession will be better able to give an unbiassed consideration to the schemes and more likely to succeed in obtaining their just and reasonable requirements.

Might I venture, therefore, to ask you, Sir, to draw attention to these facts and the confusion that seems to exist, in order to help to a successful issue the negotiations now being undertaken throughout the United Kingdom for the purpose of forming medical services for combating tuberculosis amongst all members of the community?—I am, etc.,

Brighton, Sept. 23rd. E. ROWLAND FOTHERGILL.

THE INDIAN MEDICAL SERVICE.

SIR,—I am at a loss to understand not only the motives but also the reasoning which actuated the writer of the letter signed "Major, I.M.S." published in your issue of September 21st. In regard to the former it may be admitted that circumstances *may* justify an officer attempting to disparage in an influential public journal the service to which he has the honour to belong; but by most of those who possess any feeling of *esprit de corps* it will be held that such action requires very strong justification.

In regard to the reasoning, your correspondent in the first paragraph of his letter suggests that "the best thing that could happen" to the Indian Medical Service would be for it to become a purely military service. Later on, however, in speaking of the prospects of the military side, he states: "What are they? Absolutely *nil*. A man joins, becomes medical officer of a regiment, and as such he must remain; there is no possible chance for him." It is true he ascribes this alleged state of affairs to the regimental system at present prevailing in the Indian army, but I take it he will admit that the station hospital system, which he evidently favours in common with others, though it may lead to increased military efficiency, will not develop the purely professional attainments of officers in a manner at all comparable to the vast and varied experience in the civil department now open to all officers of the Indian Medical Service.

I am wholly unable to understand what your correspondent means when he says that men are attracted to the Indian Medical Service under absolutely false conceptions of the conditions of civil employment. Until one has served in India in either a civil, military, or other capacity, it is impossible to realize fully local conditions, but I would ask him what other military medical service offers such scope for those with energy and initiative, or such opportunities for distinction as falls to the lot of officers of the Indian Medical Service in civil employment? The latter, it may be added, form the war reserve of the Indian Medical Service, and it is difficult to conceive any system whereby men not required for military service during peace can be employed with more advantage to themselves and to the State than that which exists in the Indian Medical Service. If I understand him rightly it is this system your correspondent would like to see abolished, and one in which "a man joins, becomes medical officer of a regiment, and as such . . . remains" substituted.

The facts appear to be that medical officers in civil employment, whether engaged in administrative duties carrying great responsibilities, in routine medical and surgical work, or in carrying out scientific research, perform important duties to the State which cannot be adequately undertaken for many years to come by any other service, either European or native.

It is for this reason that, in my opinion, the results of the labours of the recently appointed Royal Commission can be awaited in equanimity. The personnel of the Commission, it is true, does not inspire great confidence in the minds of members of the Indian Services generally; nevertheless, so far as the civil side of the Indian Medical Service is concerned, the Government of India (as the result of the representations of Lord Morley) are known to have studied the question in all its bearings, and they are believed to have arrived at certain conclusions. These conclusions, on account of their unanimity and authority, will carry great weight not only with the Commission but also—and this is more important—with the Secretary of State for India, who will be unable to ignore them without incurring a grave responsibility towards the people of India.

I do not propose to deal with the question of pay, referred to by your correspondent, and in this connexion I will only add that it is entirely contrary to general experience to say that the present pay is not a living wage for a married officer. When, as in my own case, it is possible to come home on furlough on £500 a year after eight and a half years' service, and at the end of thirty years' service to earn a pension of £700 per annum, it will be clear that your correspondent has failed to represent fully all the facts of the case.

My excuse for occupying so much space is that in the interest of the public service I do not think so misleading a letter as that of your correspondent should pass un challenged.—I am, etc.,

September 23rd. CAPTAIN, I.M.S.

FORCIBLE FEEDING OF SUFFRAGE PRISONERS.

SIR,—The letter of Dr. McIntosh in the JOURNAL of September 21st (p. 748), on the position of prison surgeons in respect of their duties, appears to have been written without a clear conception of the status of these officers. The duties of a prison surgeon are regulated by an Act of Parliament, 28 and 29 Vict., cap. 127. He is not a subordinate officer, but is bound to obey the directions of the governor in matters not regulated under the Prison Act, 1865. The governor has power to enforce on him the due execution of his duties. While acting as prison surgeon he is deemed, by virtue of his appointment, to be a constable (Sch. 1, s. 63). It is, therefore, an official duty to prevent a prisoner from doing any felonious act; and to attempt to commit suicide by starvation is a felony.

For neglect of duty or other misconduct he may be suspended or removed from his office by the justices in sessions assembled (Sect. 14). It is no part of his duty to decide whether the offences under which prisoners are sentenced have any political aspect, or otherwise; to him they are prisoners and patients. With respect to patients requiring forcible feeding, he deals with them as he would deal with private patients who decline to take food, thereby endangering their lives; and if he dealt otherwise with them he would be neglecting his duty absolutely.

It will be remembered in this respect that when an "eminent surgeon" was cross-examined in a suffragette action in the High Court he was obliged to admit that, should a private patient decline to take food, thereby endangering life, he would not hesitate to order such patient to be fed by forcible means.

To attack prison medical officers for performing a duty, however unpleasant it may be, which they would not hesitate to carry out in private practice where necessary, seems to be neither logical nor ethical.—I am, etc.,

London, Sept. 20th. A. G. BATEMAN.

SIR,—With regard to Sir Victor Horsley's report on forcible feeding, and the ensuing correspondence, I agree with one of your writers who deprecates the introduction of party political animus into the JOURNAL. But it is indeed surprising that he should accuse Sir Victor Horsley of this error, because, obviously, if this report is an indictment against any party, it is an indictment against the Liberal party, and we all know that Sir Victor Horsley recently stood as Liberal candidate for the University of London. Therefore it is at least proven that he has not been actuated by *party* political motives, as he has been writing against, rather than for, his own side.

This question of forcible feeding in prisons should be treated in a purely academic manner and apart from all political considerations. If the patients concerned are sane (and if insane, prison is no place for them) the question resolves itself simply into this: Do the medical profession wish to have it understood that they reserve to themselves the right—if they believe it to be for the good of the patient—to carry out on sane adult individuals, against their wishes and those of their friends, proceedings at once dangerous and painful? I turn aside for one moment to justify those two epithets. I say "painful" because we have evidence to that effect from a number of women, many of whom are only distinguishable in ordinary life from their fellows by rather an excess of philanthropic zeal. One of your correspondents brings forward—to belittle the evidence—the statement that the physical and mental torture was entirely due to the subjective feelings of these women. But all pain is subjective. Why do the medical profession believe childbirth to be painful? The vast majority of them have no first-hand experience of it. The women concerned are often mentally upset at the time, and their evidence, therefore, possibly unreliable, and on the face of it the process is a natural one and ought, therefore, not to be *a priori* painful at all! Yet we believe in its painfulness. I say also "dangerous":

(*a*) Because the patients had to be released on health grounds before the expiration of their sentences.
(*b*) Because of the evidence to that effect brought forward by medical practitioners who saw the patients on their release.
(*c*) Because, according to correspondence in the *Times* some months since, one man (non-suffragist) prisoner died under forcible feeding in 1910 and another in 1911.

Now, it seems to me that it is rather an honourable tradition of the medical profession that painful and dangerous treatment should not be carried out against the wishes of sane adult patients and their friends, even in order to save life. One remembers the cases that have been reluctantly permitted to leave hospital to die when, humanly speaking, only an operation could save them, and would have saved them easily, because the patients have refused their consent.

It is noteworthy that in these prison cases the results of forcible feeding appear to have been unusual. As one of your correspondents observes—here "results follow this process of introducing the tube out of all proportion to those which have been observed previously." One remembers cases of artificial feeding carried out over long periods with very little deleterious effect on the patients. But had they lost weight at the rate these suffrage prisoners appear to have done, they would have been non-existent long before the necessary term of such feeding expired.

In all but asylum cases (where endless notes and reports rightly safeguard the interests of the patients as much as possible) a person is able to terminate the ministrations of his physician at his pleasure; this is not the case in prison: he must be treated willy-nilly, it is in camera, with no friends present to witness what is done, and the doctor concerned has, in the nature of the case, no private practice to suffer if he persists in treating his patients in a manner—"dangerous" and "painful" to boot—that such patients deplore. This is a condition of things against which, now it is brought to their notice, it seems to me that it would be in keeping with high medical ideals for the profession to protest. It is a matter of indifference whether the patient is Tom Mann or Sir Edward Carson, a quaker or an anarchist, an angel suffering for humanity, or a player to the gallery. This is a matter for the profession to discuss apart from any political consideration.

Some of the laity, with that habit of loose thinking—so tenacious where medical issues are at stake—have been heard to say, "Serve 'em right." That may be. But if treatment involving "pain" and "danger" is to be meted out as punishment, the dose should be prescribed by the magistrate, and most certainly not administered by the doctor, whose mission in prison is distinct from that of a disciplinarian. Let the Home Secretary and suffragists fight it out between them without medical interference. If the former prefers to let suffragists starve rather than account them as political prisoners, that is his affair, for which he will answer to the nation in due course; if, on the other hand, suffrage prisoners prefer to die rather than tacitly admit that they are actuated by the motives of common criminals, that, again, is their affair, for which they and their friends will be judged at the bar of public opinion.

In a political struggle of this kind "painful" and "dangerous" medical treatment which helps one of the parties in the struggle to get out of a dilemma, and which, applied against consent, increases the difficulties of the other party, seems an impertinence.

Finally, this question has to my mind arisen at a very opportune moment. Just now many medical men are interested in the compulsory treatment of school children. Whether Sir Victor Horsley's report will tend to give the public confidence in placing themselves unreservedly in our hands I have reason to doubt.—I am, etc.,

London, N.W., Sept. 23rd. H. B. HANSON.

SIR,—It is impossible to adopt the opinion of Dr. A. G. Welsford that the question of forcible feeding should be excluded from the JOURNAL on the pretext that it is a non-party organ.

Such reasoning would debar from comment in your columns references to the Mental Deficiency Bill, the State regulation of vice, and many other matters of general and professional interest. In common with Dr. Hubert Norman I trust that free discussion of this unutterably distressing report will be encouraged.

Apart from the question as to why such treatment should be persevered with when in so many instances the result has not justified the alleged reason of its administration, that is, the detention of prisoners till the termination of their sentences, the ethical side is one of considerable moment to those who are in general practice, and who are constantly being asked by patients who have read of cases as Miss Davison's such questions as the following: "Are prison doctors forced to do things to prisoners which they know are bad for them if they are ordered to do so by the Home Office?"

If this is not the case, how did "an eminent specialist" say that Miss Davison was in a fit condition to be forcibly fed, after attempting suicide to avoid what was to her a horrible ordeal, when she was in such a grave state of health that she had to be released unconditionally immediately after this treatment had been carried out? "Do specialists often make mistakes like this? What would you do in such a case?"

While *esprit de corps* constrains one to put as good a face on the matter as is possible where one's colleagues are concerned, one is in a singularly awkward position when all the evidence at one's disposal points to the fact that these men allowed themselves to be made executioner's tools. Treatment such as is quoted in the report requires much explanation, though obviously, if the evidence of the many victims themselves and that of the members of the medical profession who examined them on their release is to be ruled out of court, it is difficult to see how such charges can be anything but "unproved." How does Dr. Welsford suggest that proof can be obtained?

London, S.E., Sept. 14th. H. GORDON CLARK, M.D.

SIR,—In your issue of September 21st there appears under the above heading a letter which—be it said without offending—is more a credit to the heart than the head of the writer.

The attempt to commit suicide is an offence at law, irrespective of whether it is attempted inside or outside a prison, and any person aiding actively or passively is *particeps criminis*.

Are we to understand from Dr. McIntosh's letter that he advocates that the forcible feeding is to be done by the warders? Heaven help the ladies! If he does not mean this, are we to understand that he thinks every criminal should be immediately liberated when he refuses his diet? Heaven help the public!

The question, to my mind, involves a grave national scandal—not as Dr. McIntosh takes it, but this way: the administration of justice would be reduced to a farce if penalties for crime were successfully evaded by refusing food. If the suffragette *must* be liberated when she declines to eat, how would you justify the refusal of the same privilege to the burglar?

Personally I would welcome a measure which would give a vote to women who pay rates and taxes; but that is very different from tolerating open defiance of the law.—I am, etc.,

London, E., Sept. 24th. GRAHAM GRANT.

THE NATURE, ORIGIN, AND MAINTENANCE OF LIFE.

SIR,—In his address before the British Association, Professor Schäfer has given us an excellent summary of our present knowledge of the physico-chemical mechanism of life and its origin, but I hardly think he is justified in including in his title the expression "nature of life." Life from its very nature is an unknown quantity, and must remain for ever so, as long as man's senses remain limited as at present.

To me it seems the point of the whole thing is, Where does consciousness figure in the problem? The mention of it in the address is scanty, much belated, and, to say the least, unconvincing. For most of us the salient feature of life is the phenomenon of consciousness, and by this I do not refer to self-consciousness, which is a highly-evolved product late to appear in the evolutionary scale. There must be in the simplest forms of life a rudimentary consciousness—something of the same order of existence out of which those higher degrees of consciousness as we know them are evolved—something which divides animate from inanimate matter.

Let us suppose for the sake of argument that those complex molecular vibrations which occur in undifferentiated living protoplasm, and give it its specific characters, are totally unaccompanied by any degree of consciousness. Then the question naturally arises, at what stage in the evolutionary scale of living things does it begin; for every evolutionist must admit that it has been evolved, and if so, "From what?" it may be asked.

This supposition, then, leads us to the conclusion that at a certain stage of evolution consciousness comes into existence apparently from nothing, which is absurd.

To say that certain cells of the external layers of an organism, in virtue of their position, become specially sensitive to the stimuli of the outer world would be probably true if by the term "sensitive" we mean reactive from the chemical point of view, but if otherwise we imply sensation, then we are merely begging the question at this stage.

I think the only logical view from the evolutionary standpoint is to admit that consciousness does not come into existence *de novo* at a certain stage in the evolutionary scale of living things but that it existed *ab initio*. There must be in the primitive protoplasm some rudimentary undifferentiated consciousness as the unit out of which the whole psychic life of the higher animals has been built up in the course of evolution, up to and including self-consciousness. It is a principle of biology that the vital functions that obtain in the higher organisms all occur in the simplest protoplasm but in a simpler form; we can hardly imagine, however, that the content of consciousness of such a simple form of protoplasm could be more than a pure, primitive, tactile sensation of the feeblest kind.

If we admit that the life process is always necessarily accompanied by consciousness, and that that is its chief and specific characteristic as differentiating it from non-living matter, then this fact alone justifies us in condemning life as merely a physico-chemical process, for no one will suggest that chemical actions alone are the subject of consciousness. Further, it argues well for life being a specific form of energy.

Now in these days we see everything through the spectacles of evolution. We have applied evolution not only to biology but to every branch of knowledge. In chemistry even our elements are looked upon as survivals—stability under the existing circumstances being the determining factor—evolved from one primordial element. Why should we not apply the evolution hypothesis to energy, and look upon the different forms of energy—radiant, thermal, electrical, chemical, etc., culminating in vital energy—as higher degrees evolved from some original form of energy, and which in process of operation on resistent matter are apt to dissociate into some of their simpler components, thus accounting for the transformations of energy known to physics? The principle of the conservation of energy and equivalent energy is not endangered. It is one of the specific characteristics of chemical combination that the product produced has entirely different properties from those of its constituents. No reason will explain it; we have to accept it as a fundamental fact. It is equally possible that combinations of different forms of energy might produce entirely different phenomena, including those of conscious life itself, as the highest and most finished product.

I look upon life, then, as a specific compound form of energy of its own kind, the highest product in the evolution of energies, and which in its operation dissociates *pari passu* into some of its components—chemical, electrical, thermal, etc.—which are then conspicuously free to act of their own accord, and have thus given rise to the idea of life as a purely physico-chemical process, as this is most in evidence.

In conclusion, although one may relegate life or consciousness to its proper place among phenomena, yet one does not explain it, and we can only banish the problem to final unknowable causes.—I am, etc.,

London, E., Sept. 19th. FRANK B. SKERRETT.

WHOOPING-COUGH AND IODOFORM INJECTIONS.

SIR,—After perusing the paper by Dr. Dewar in the JOURNAL of September 21st one remains with the impression that an equally good result might have been obtained by many other forms of treatment, or by none beyond good hygiene. Some data, also, necessary to enable a conclusion to be drawn by any one, are omitted, though, no doubt, Dr. Dewar considered them. So he must pardon if others hesitate to make the jump he has so easily accomplished; must also pardon some amusement at this rushing into print with one case, and talk about "looks like a specific treatment." Should we envy or deplore such simple faith? It seems to come easily to those who picture all their therapeutic efforts as pregnant with large results, and all effects to be due to the one cause they initiated.

Dr. Dewar, however, naïvely admits that his object in writing was, not so much to present this treatment as to again direct attention to the intravenous treatment of pulmonary disorders, especially phthisis, by injections of iodoform; and a letter from a medical friend in the Transvaal satisfies him that this treatment is useful "in pneumonia, asthma, and leprosy, as well as syphilis." This is a sweeping statement to endorse in so bold a way, and hardly deserves the prominence Dr. Dewar accords it.

There may be much in Dr. Dewar's contentions, but this paper illumines the personal equation, which readers of the contributions to your paper must always estimate, and one is inclined to classify Dr. Dewar as of those people, combining enthusiasm with simplicity, who may be termed therapeutic optimists.

If Dr. Dewar will turn over his JOURNAL to page 690 he will find there an example for therapeutic investigation without the optimistic element.—I am, etc.,

Glasgow, Sept. 24th. R. O. ADAMSON.

MEDICAL SCIENCE AND WEIGHTS AND MEASURES.

SIR,—Medical men suit their own convenience when using the British tables of weights and measures in preference to the metric system. Custom, practice, thought—these three unite to make the British system popular. It adequately meets all practical requirements. The general practitioner never thinks of the metric system except when reading professional and scientific treatises. On these occasions he converts one system into the other if he has a medical diary at hand, if not he wearily skips the figures, and wishes to goodness that some enterprising firm would place on the market measures, thermometers, etc., marked with both British and metric scales. The want of means of practising and thinking in the metric system is the chief cause of our retaining the British system. The kindergarten method of having measures, etc., marked with both scales would in a brief

period familiarize the profession with the metric system and it would become exclusively used. Medical men would welcome anything that will enable them to read modern textbooks without the necessity of having to make a mathematical calculation every time they come across a figure in the text.—I am, etc.,

Dublin, Sept. 23rd. SEYMOUR STRITCH.

MENTAL DEFICIENTS AND THE COMMUNITY.

SIR,—Should we not believe that God helps those who help themselves as well in eugenics as in everything else? Nature has furnished us with a certain amount of plastic substance which within certain definite limits we can fashion more or less as we please. Is there not something of the immorality of gambling in allowing the human type to depend, as Samuel Butler would have said, upon a throw of the dice?

Gabriel Tarde, in his well-known book, *Les Lois de l'Imitation*, tells us: "We can already foresee the day when civilized man, after having created so many animal and vegetable varieties of inferior life suited to his wants or caprices, and kneaded to his wish as if to exercise himself for a higher design, will be bold to attempt the problem of being his own breeder, of knowingly and deliberately transforming his own physical nature in conformity with the needs or wishes of his final civilization." He also reminds us that in four centuries the ideal created by the cult of the Delphian Apollo culminated in the age of Pericles, that classical period which witnessed the production of the finest race, physically and intellectually, that the world has ever known. What a seeming reproach, then, to our time that after nineteen centuries of Christianity we in England should be faced with such a blot on the country and the empire as the slum population, for instance, and all that it implies, of London and other large cities.—I am, etc.,

September 19th. SOCIOLOGIST.

Special Correspondence.

BUDAPEST.

Notable Decrease in the Mortality amongst Consumptives in Hungary.—Prevalence of Insanity amongst Doctors and other Professional Men in Hungary.—Epidemic of Acute Poliomyelitis in Hungary.

THE untiring efforts of the numerous societies founded for the purpose of stamping out consumption in Hungary have already been rewarded by a steady fall in the annual number of deaths caused by that disease. The official returns for the year 1905 prove that out of 10,000 inhabitants 45 died of tuberculosis, whilst the mortality for the next six years was as follows: In 1906, 37.6 per 10,000; in 1907, 37.1; in 1908, 36; in 1909, 35.1; in 1910, 33.7; in 1911, 31.4. It is true that the average death-rate from tuberculosis in Germany is only 16.8 per 10,000 inhabitants; but, according to Fay, if the deaths from all the other diseases of the respiratory organs are included, the total German death-rate is in reality no lower than that of Hungary. Another proof of the excellent work accomplished by these societies may be seen in the fact that the Hungarian regiments suffer less from tuberculosis than any other corps in the Austrian army.

A startling statement has recently been made by Dr. Koloman Paudy, Senior Physician to the State Asylum at Lipotmezö. Dr. Paudy, who has made a careful study of the life-histories of the 12,000 patients admitted to the asylum during the last forty years, has come to the conclusion that 53 per cent. of the cases of insanity amongst professional men were avoidable. Every one of these cases, he tells us, died of paralysis, 29 per cent. being doctors under 36 years of age. As regards doctors over 36, the percentage of deaths from paralysis amounted to 77, whilst amongst lawyers who had passed the same age it rose to 89. Out of 53 members of the latter profession, ranging from 40 to 60 years of age, 51 succumbed to paralysis; and the 11 actors admitted to the asylum during the period in question all suffered from the same disease. As regards the prevalence of paralysis in other professions, the army was represented by a fairly large proportion—94 per cent. of military officers over 36 years of age—and the Church by 82 per cent. of Protestant and 42 per cent. of Catholic clergymen. The lowest proportion seems to be found amongst Jewish school teachers, there being only 6 per cent. under and 40 per cent. over 36 years of age in the total number of cases. On the other hand, the proportion of paralysis amongst the total number of mental diseases in Jewish merchants over 36 rises to 93 per cent.—thereby affording conclusive evidence that it is moral conduct, not circumcision, that protects the Jew from syphilis; whilst in agricultural labourers it is only 25 per cent., and in railway and navigation men 71 per cent. The connexion between paralysis and immorality is clearly proved by the data afforded by the histories of female paralytics, the proportion of paralysis amongst women between the ages of 16 and 30 being only 2 per cent., whilst in prostitutes of the same age it rises to 30 per cent., and amongst women between the ages of 31 and 36, 8 per cent., as compared with the 60 per cent. amongst their less fortunate sisters. It is surely a significant fact, moreover, that no one has yet seen a paralytic nun. These figures, in Dr. Paudy's opinion, prove that paralysis undoubtedly depends largely upon the previous presence of syphilis. There seems every reason to believe, therefore, that only a man suffering from the latter is likely to be smitten by the former, and that he who is free from the one is likely to escape the other. Alcoholism ranks next to syphilis as an etiological factor of paralysis, and, unfortunately, this cause is almost as frequent amongst the educated as amongst the uneducated classes. This is proved by the fact that though only 9 per cent. of non-paralytics amongst the doctors owe their mental disease to alcohol, 41 per cent. of the judges, 21 per cent. of the military officers and post-office officials, and 32 per cent. of the railway employees have been reduced to their present condition by a reckless indulgence in intoxicants. On the other hand, not one of the 33 Jewish school teachers suffered from alcoholic mental disease, a fact which also proves that epilepsy is relatively uncommon amongst Jews. These figures, compiled from the observations made during forty years' attendance at the Lipotmezö Asylum, convey an important moral. It is Dr. Paudy's deliberate opinion that all these unfortunate persons could, humanly speaking, have been saved from their disease if in early youth they had learnt to resist temptations to drunkenness and immorality. In this respect Hungary compares very badly with such a country as Sweden, for example. Whilst only 1 per cent. of the inmates of the Swedish State asylums are paralytics, the Hungarian establishments contain as many as 18 per cent. suffering from this disease, and, moreover, many of the patients are doctors, lawyers, and other professional men who, instead of being an object of expense to the State, ought to be capable of working for twenty or thirty years for their own and the public welfare.

An outbreak of poliomyelitis has been rife in Hungary for the last eight or nine months, and has already claimed many victims amongst the children of the country. In the majority of cases the disease is very acute and there is almost always more than one convulsion. It is believed to have been brought across the frontier from the Balkan States, where a similar epidemic was raging some time ago; but although every precaution has been taken to prevent its spread, up to the present they have been of no avail. The director of the Stephania Children's Hospital, Professor Bokáy, has therefore petitioned the Minister of Public Hygiene to order the notification of every case to the local district medical officer, and to empower doctors to remove patients to the hospital if they cannot be properly isolated in their own homes. This request has been granted, and the district medical officers, moreover, have been ordered to send in a monthly report on the progress of the epidemic in their respective districts

AT a meeting of the eighth International Congress of Applied Chemistry held in New York on September 13th, a resolution was adopted expressing the opinion that the disinfectants used in different countries should be controlled by a simple bacterial test capable of being easily effected, and a committee of three was appointed to meet a similar committee which the International Congress of Hygiene and Demography has been invited to nominate for the purpose of defining that test.

Obituary.

JOHN E. RANKING, M.D., F.R.C.P.,

SENIOR PHYSICIAN, TUNBRIDGE WELLS GENERAL HOSPITAL.

DR. J. E. RANKING, of Tunbridge Wells, died on September 11th, in his 63rd year, as the result of a motor accident. His car was going down a hill at Bexhill, when, in order to avoid a woman, the driver applied his brakes sharply, and the car skidded and overturned. Dr. Ranking sustained severe injuries, from which he succumbed two hours later, while Mrs. Ranking was also badly hurt. He was born at Hastings, where his father, Mr. Robert Ranking, was engaged in practice, and received his early education at Aldenham School and Hertford College, Oxford; he afterwards went to St. Bartholomew's Hospital, and took the diplomas of M.R.C.S.Eng. and L.S.A. in 1874; he graduated M.A. and M.B.Oxford in 1876, and proceeded to the M.D. in 1879. He was for a time prosector of anatomy at the Royal College of Surgeons of England, and in 1880 became physician to the General Hospital, Tunbridge Wells, a post which he retained until his death, being at that time senior physician. He was President of the South-Eastern Branch of the British Medical Association in 1898–99. He held a leading position as a physician in Tunbridge Wells, his opinion being highly esteemed as a consultant. He married the eldest daughter of the late Dr. Duncan, of Tunbridge Wells, and leaves two sons, both members of the medical profession, and three daughters.

DR. MATTHEW BURKE SAVAGE, a well-known Dublin physician, died last week at his residence, 8, Rutland Square, Dublin, aged 46. He had been in ill health for some time. Dr. Savage was the eldest son of the late Dr. Savage of Newry. As a student he distinguished himself in the Catholic University Medical School, Cecilia Street, being a double Leonard prizeman. In 1889 he won the gold medal in clinical medicine, and the only medal awarded in surgery in the Mater Misericordiae Hospital. He was first appointed demonstrator of anatomy in the Cecilia Street School, and resident physician in the Mater Hospital. He next became physician in the extern department of St. Vincent's Hospital, and subsequently visiting physician to Jervis Street Hospital and to a number of private hospitals and nursing homes. About twenty years ago he started practice in Dublin. He was an expert in pulmonary diseases. In spite of his large practice he was keenly interested in sport, and for some time had racehorses in training at the Curragh.

A REUTER telegram from London, Ontario, announces the death of Dr. J. STUART DICKIE, until recently senior demonstrator of anatomy at Queen's University, Belfast. He had been appointed Professor of Anatomy at the Western Medical College, and had gone out to Canada to take up the duties of that office. He graduated M.B., B.Ch., B.A.O., R.U.I., in 1905, with first class honours, and won an exhibition. He took the degree of M.D.Belfast in 1910. He had been senior and junior house-surgeon at the Miller Hospital, Greenwich, and house-physician at the Canterbury Hospital.

Universities and Colleges.

UNIVERSITY OF LONDON.

KING'S COLLEGE.

Departments of Bacteriology and Public Health.

MORE accommodation has for some time been urgently needed in the departments of bacteriology and public health. This has now been provided, with the sanction and approval of the university, by the removal of these departments with their staffs to 62, Chandos Street, Strand, W.C. (Charing Cross Medical School buildings), where an excellent suite of laboratories is at present vacant owing to the transference of the classes for preliminary and intermediate medical studies of the Charing Cross Medical School to King's College. The laboratories at Chandos Street are being altered and refitted, and the accommodation there provided will comprise a large class laboratory, research laboratory, professors' laboratory, and lecturers' laboratory for the departments of bacteriology and public health respectively, a photomicrographic laboratory, preparation and animal rooms, a large theatre, office and library for the joint use of the two departments. The regular courses of instruction in bacteriology, clinical pathology, and photomicrography, and for the diploma of Public Heath will be given there, and research and investigation work for public bodies and others will also be carried on as before. The new laboratories will be opened on or about October 1st; those vacated at King's College by this removal will be utilized for increasing the accommodation for the preliminary and intermediate medical studies.

LISTER INSTITUTE OF PREVENTIVE MEDICINE.

During the winter session a series of lectures dealing with problems in hygiene and preventive medicine will be given on Wednesdays and Fridays at 4 p.m., beginning on Wednesday, October 16th. The lectures will be addressed to advanced students; students of the university will be admitted free, while others can obtain a card of admission on application to the Secretary. On October 16th, 25th, 30th, November 6th and 13th, Dr. Dean will lecture on recent work on the serum reactions; on October 18th and 23rd Mr. Bacot will lecture on the binomics of fleas and on the method of rearing them for experimental purposes. On November 1st, 8th, and 15th Mr. Greenwood will discuss some methods of epidemiological research, and on November 22nd, 29th, and December 6th Dr. Ledingham will review some problems of immunity. Mr. Atkin will lecture on the electrical method of determining the reaction of fluids on November 20th and 27th, and Dr. Penfold will discuss studies in bacterial variations on December 11th and 13th.

The Services.

THE SANITARY COMMISSIONER WITH THE GOVERNMENT OF INDIA.

THE Government of India has issued a resolution on the position of the Sanitary Commissioner with the Government of India and the question as to what changes are necessary in the functions and duties of the appointment so as to increase its utility and efficiency. The resolution takes a retrospect from 1880 to March, 1911, when, owing to the lamented death of Colonel Leslie, the Director-General of the Indian Medical Service, was appointed to hold charge of the duties of Sanitary Commissioner in addition to his own duties. The resolution proceeds:

In the meantime the entire question was carefully reconsidered by the Government of India, with special reference to certain disadvantages which had resulted from the entire separation of the appointment of Director-General, Indian Medical Service, and Sanitary Commissioner. They were advised in particular that the divorce between the sanitarian and clinician which resulted from that separation had led both to the loss of administrative efficiency and to the unpopularity of the specialized bacteriological and sanitary departments. Increasing difficulty was experienced in recruitment, and the closer co ordination of research and practice appeared essential if more rapid progress was to be made in the improvement of public health and the prevention of disease. Moreover, the claims on the Sanitary Commissioner's time for office and bacteriological work cut short the period of touring and rendered it difficult for him to be in such close touch with the local authorities as was desired. After correspondence with the Secretary of State and local governments, it has now been decided that a remedy for the defects of the existing system can be best provided by a systematic modification of the functions of the Sanitary Commissioner; and the appointment has, therefore, been revised on the same terms as regards designation, pay, and term of tenure as before, with a view to secure the better co-ordination and co-operation of the sanitary and medical departments.

It has been decided that the Sanitary Commissioner shall in future be subordinate to the Director-General, Indian Medical Service, to the extent originally recommended by the Government of India in 1904, and that work connected with the bacteriological research shall also be placed under the latter officer. In regard to administrative questions and matters affecting the *personnel* of the sanitary services, the Sanitary Commissioner will be in the position of a staff officer to the Director-General, Indian Medical Service. He will be given independent authority in technical sanitary matters, with power as at present to correspond direct with the Government of India. He will occupy the position in regard to local governments and the officers under them laid down in paragraph 12 of the Resolution No. 1273/1290, dated September 8th, 1904. In order to relieve him of as much routine work as possible, the office establishment of the Sanitary Commissioner and the Director-General, Indian Medical Service, will be amalgamated. The statistical officer will in future assist the Director-General, Indian Medical Service, in the control of the sanitary section of the office as well as in the guidance of research work and the bacteriological department. His designation will be altered to that of Secretary to the Director-General, Indian Medical Service (Sanitary). The Sanitary Commissioner will, under these arrangements, be able to tour freely and regularly throughout India with a view to co-ordinate the lines of development, to inspect works of sanitation actually in progress, to advise on

projected schemes, and generally to disseminate the knowledge acquired in the different provinces.

The statement attached to the resolution contains details of grants which have been made in recent years from imperial revenues towards sanitation and research. In every province important schemes for the improvement of urban sanitation are now in course of execution. A preliminary survey has been in progress in several provinces, with a view to the preparation of schemes designed to effect the improvement of malarial conditions, and in particular to extirpate, if possible, the *Anopheles* mosquito in selected areas. Projects are now ready in more than one province, and grants are being made for their execution from imperial revenues. The data thus obtained will, it is hoped, be of very great value in planning future preventive measures.

The important questions of controlling and regulating the expansion of growing towns and of strengthening the existing powers of local authorities in dealing with congested urban areas are ripe for consideration and discussion, and the Government of India has recently addressed the local governments on the subject. The scheme, described in the BRITISH MEDICAL JOURNAL of June 22nd, p. 1454, for the general reorganization of the sanitary services throughout India has received the sanction of the Secretary of State, and, with the introduction of a trained staff, a general improvement in the condition of urban sanitation may reasonably be expected. A wide sphere of useful work, therefore, lies before the Sanitary Commissioner as an advisory authority, and the Government of India believe that the appointment under its new conditions will be of increased benefit to themselves and to local administrations.

ROYAL ARMY MEDICAL CORPS (T.F.).
EAST ANGLIAN DIVISION.

ON Saturday evening, September 21st, the officers of the Royal Army Medical Corps entertained Colonel G. S. Elliston, C.B., at dinner at Cambridge on his vacating the appointment of Assistant Director of Medical Services in the East Anglian Division. About thirty sat down, Colonel S. S. Hoyland, his successor, being in the chair. Amongst those present were: Colonel J. Griffiths and Major Apthorpe Webb, representing the First Eastern General Hospital; Lieutenant-Colonel Brooks, Lieutenant-Colonel Stacy, and Majors Oldfield, Freeman, Milligan, and Crawford, representing the four field ambulances; as well as a number of captains and subalterns from other units. After dinner the Chairman, on behalf of the officers of the corps, presented Colonel Elliston with a silver tea-tray as a souvenir of his forty years' service in the Volunteer and Territorial Forces. Letters of regret for absence were read from Sir Clifford Allbutt, K.C.B., Honorary Colonel Howard Marsh (Master of Downing College), Professor Sims Woodhead, Major H. A. Ballance (Norwich), Major Fremantle (the sanitary officer), and others away on holiday. Lieutenant-Colonel Brooks and Major Apthorpe Webb acted as honorary secretaries.

Public Health
AND
POOR LAW MEDICAL SERVICES.

INTERCEPTING TRAPS IN HOUSE DRAINS.

THE disconnexion of house drains from sewers by means of a trap has been for many years the subject of controversy between sanitary engineers and medical officers of health. The former have maintained that it is all-important to exclude sewer air from buildings, and that this can best be accomplished by placing between the house and the sewer a simple siphon trap, and providing that a portion of the drain between this trap and the house shall be open to the air. This view has been endorsed by the Local Government Board, which has frequently insisted upon a by-law to the effect that there shall be provided within the curtilage of every new building in every main drain or other drain of the building which may directly communicate with any sewer a suitable trap at a point as distant as may be practicable from the building, and as near as practicable to the connexion of the drain to the sewer. In actual practice it has been found by medical officers of health that where these intercepting traps have been placed, a large number of them speedily become blocked, with the resultant blocking of the house drain. As the result of a proposal by the Willesden Urban District Council to adopt a series of by-laws in which the requirement as to the provision of an intercepting trap was to be omitted, to which proposal the Local Government Board refused its assent—a departmental committee was appointed by the Board "to inquire and report with regard to the use of intercepting traps in house drains." The committee, consisting of Dr. Darra Mair (as chairman), Mr. Grenville Malet, M.Inst.C.E., and Mr. H. J. Pearson, A.R.I.B.A., began its inquiries at the end of 1908, and presented a report in December, 1911. That report[1] has just been issued, and is of considerable importance, for it practically supports, with some qualifications, the contention of those who contend that the intercepting trap not only is unnecessary, but is actually harmful.

The committee came to the conclusion, as the result of investigations in a large number of districts, that the disadvantages involved by the use of the intercepting trap were substantial and of serious practical importance, and that as the most important of the effects of these disadvantages are concealed from view, they may remain in existence quite unknown to the householder. It is pointed out that although the liability of the trap to become blocked appears to be insuperable, its evil effects can be minimized by constructing the house drain, or at least the lower part of it, of iron pipes, and by closing with a movable cover the usual open channels in the inspection chamber which is provided as means of access to the trap. Apart from the great disadvantage of blocking, the committee considers that the trap does serve as an effectual barrier to the entry of sewer air into the house drain, this being the fundamental advantage claimed for it. The question therefore arises whether sewer air is harmful. The bacteriological evidence placed before the committee went to show that microorganisms of sewage origin, while very rarely present in sewer air, were present in drain air in large numbers. This difference is attributed to the splashing of sewage which occurs in drains, and which does not usually occur in sewers. The necessity of the intercepting trap on bacteriological and epidemiological grounds has not, in the opinion of the committee, been established. Apart, however, from the presence of bacteria, specific or otherwise, the characteristic of sewer air is its smell, and it was found that this was less perceptible when there was no intercepting trap, owing to the greater opportunity afforded the air to escape entirely at a height above ground. It is conceded that exceptionally this smell may be so offensive that its escape even at a height might be a perceptible nuisance, so much so that it might be necessary to close as many sewer ventilators as possible, whether at the ground level or at a height. The committee advises, therefore, that the question whether, in order to prevent nuisance from smell in such exceptional cases, the intercepting trap is or is not required in any locality is one which will need to be considered and determined by the local authority and their advisers in the light of local conditions.

[1] Report of the Departmental Committee appointed by the President of the Local Government Board to Inquire and Report with regard to the Use of Intercepting Traps in House Drains. London: Wyman and Sons, Limited. 1s. 1d. (Cd. 6369.)

MILK AND CREAM REGULATIONS.

As long ago as 1901 a Departmental Committee on Preservatives and Colouring Matters in Food recommended that boric acid or mixtures of boric acid and borax should be the only preservatives permitted in cream, and that these preservatives should not be added in amounts exceeding 0.25 per cent. expressed as boric acid (H_3BO_3). It was also recommended that the amount of such preservative should be notified by a label on the vessel containing the cream. Following the publication of these recommendations, many traders adopted the practice of declaring the presence of boron preservatives in cream supplied by them, and successful action was taken by many local authorities where the proportion of 0.25 per cent. of boric acid was found to have been exceeded in samples taken by food inspectors. In 1909 there was issued a very full report[2] to the Local Government Board by Dr. J. M. Hamill on the use of preservatives in cream, in which he urged that effect should be given to the recommendations of the Departmental Committee, and early in the present year a further report[3] to the Board by Dr. G. W. Monier-Williams was issued on analyses and methods of detection of certain proprietary substances sold as preservatives for milk, cream, etc. The Local Government Board has now made regulations under the Public Health (Regulations as to Food) Act, 1907, which are designed to secure that no preservative shall be added to milk, or to cream containing less than 35 per cent. by weight of milk fat, at any stage from the place of production to that of delivery to the purchaser. Preservatives are defined in the regulations as any substance (other than cane or beet sugar), preparation, or solution which, when added to the milk or cream, is capable of retarding the onset of sourness or decomposition, or is capable of neutralizing acidity (sourness) in milk or cream. In the case of cream containing 35 per cent. or more by weight of milk fat, the only preservatives permissible by the regulations are boric acid, borax, a mixture of boric acid and borax, and hydrogen peroxide, and the amount of these substances when used must be clearly stated on the receptacle containing the cream, while in the case of refreshment rooms, restaurants, etc., where such preserved cream is used, a notice to that effect must be conspicuously displayed. The regulations also prohibit the use in cream of any thickening substance (which is defined as sourate of lime, gelatine, starch, paste), or any other substance which, when added to cream, is capable of increasing its thickness. The regulations come into force on October 1st next, though the operation of one portion is postponed until January 1st, 1913. This provides that in every advertisement, price list, etc., dealing with preserved cream for human consumption, such article shall be clearly described as preserved.

BUILDING BY-LAWS IN RURAL DISTRICTS.

IT is the custom for those who are insufficiently informed on the subject to attribute the lack of cottages in rural districts to the stringency of local building by-laws. However true this may have been in former years when there was little or no

[2] Reports to the Local Government Board on Public Health and Medical Subjects. (New Series, No. 13.) Price 3d.

[3] Reports to the Local Government Board on Public Health and Medical Subjects. (New Series, No. 60.) Price 2d. London: Wyman and Sons, Limited.

differentiation between the needs of urban and rural districts, it is far from being correct at the present time. As long ago as 1901 the Local Government Board compiled a model series of by-laws having special reference to rural districts, and there has of late years been evidence of a desire on the part of the Board to lessen, as far as possible, restrictive regulations. In a circular letter dated August 29th, addressed to both urban and rural district councils, the Board points out that new methods of construction and design almost inevitably demand periodical revision of by-laws, and offers to render assistance to those authorities who may desire to modify their existing by-laws by referring them to clauses which have been embodied in series already adopted, or by such other suggestions as may be practicable. The Board goes on to say that in many parts of the country (and especially in rural districts) there is great need for better cottage accommodation, so that rural district councils should be careful to see that the requirements of their by-laws, whilst prescribing conditions essential to health, are not such as to offer any impediment to the erection of suitable dwellings. It appears that the Board has tentatively framed, for working purposes, a series of by-laws, intermediate in character between the urban and rural model codes, suitable for rural areas which are beginning to assume urban characteristics. This series contains the same clauses with respect to the level, width, and construction of new streets as the urban model, but includes only those clauses concerning the structure of walls, foundations, roofs, and chimneys of new buildings which are the most important for securing stability and the prevention of fires and for purposes of health. It also contains a special clause partially exempting small dwellings, where sufficiently isolated, from the structural requirements relating to walls.

OPERATIONS BY DISTRICT MEDICAL OFFICERS.

IN reply to a correspondent, we may point out that no Poor Law medical officer can be ordered by his Board to perform any operation. If a lawful order be issued by the relieving officer, a medical officer is bound to attend any one residing in his district, but he is the sole judge of the kind of treatment necessary. In the case mentioned he might not think it desirable in the interests of the patient that the operation should be performed at the patient's house, and can recommend his removal for that purpose to the Poor Law infirmary. Again, he may consider it inadvisable to do any operation, and may prefer other treatment.

Medico-Legal.

PERPLEXED.—A registered practitioner possessing the diplomas of M.R.C.S. and L.R.C.P. has the legal right to practise dentistry, and, registered medical practitioners having been exempted from the prohibitory clauses of the Dentists Act, can use any title such as dentist or surgeon dentist. Most of the dental schools admit qualified medical men to a shortened and modified course of instruction, but it would take some time to acquire the requisite knowledge and manual dexterity.

WORKMEN'S COMPENSATION CASES.

Epilepsy or Accident.

IN a case at Salford (May 20th) it appeared that the late husband of the applicant was thrown from his lorry owing to his horse being startled by a motor vehicle. He was picked up unconscious with wounds in one of his legs, and became an in-patient at the Salford Royal Hospital until December 9th, and an out-patient until February 9th, when he was readmitted in a state of unconsciousness due to an epileptic fit. This was followed by a succession of fits, until death occurred ten days later.

Dr. E. W. Archer said that it was extremely rare for persons 34 years of age to have epileptic fits of this kind without any apparent cause. There was one form of epilepsy which might have resulted from the wounds in the leg, or in the fall from the lorry an injury to the head might have set up a cause.

For the defendants, Dr. Tylecote said that a man might have a form of epilepsy unrecognized for many years. The attacks might be very slight, and occur only during the night. Later they might become typical and be recognized for what they really were. He concluded that this was the case with the deceased, as there was nothing to account for his epilepsy. If it had come from the wound it must either have been accompanied by meningitis or been caused by some germ entering the blood through the wounds, and there was no evidence of either.

The judge said that for the non-medical mind it was difficult to resist the feeling that in this case there was some connexion between the accident and the convulsions which resulted in exhaustion and death. But whilst one sympathized with the widow and mother and children, that was not the test the court had to apply. He was bound to give his decision in accordance with the law as expounded in various cases, the result of which was that the applicant had to satisfy him that death was actually due to the accident. Nobody could say definitely that there was any tangible connexion between one and the other, and therefore there must be an award for the respondents.

Medical News.

SIR RICKMAN J. GODLEE, President of the Royal College of Surgeons, will distribute the prizes at the Royal Dental Hospital, Leicester Square, on Tuesday, October 22nd, at 5 p.m.

THE course of lectures and demonstrations at the Queen's Hospital for Children, Hackney Road, will commence on Friday next at 4 p.m., when Dr. Sydney A. Owen will give a lecture on heart disease in young subjects.

AT the meeting of the Society for the Study of Inebriety to be held on Tuesday, October 8th, at 4 p.m., at the house of the Medical Society of London, Chandos Street, W., Dr. Herbert Rhodes will open a discussion on alcoholism and tuberculosis.

The opening meeting of the thirty-first session of the West London Medico-Chirurgical Society will take place at the West London Hospital on Friday next at 8.30 p.m., when the President, Mr. G. P. Shuter, will deliver an address on the history of nitrous oxide anaesthesia.

THE King has granted permission for the Hammersmith memorial to the late King Edward VII, which takes the form of an endowed cot in the West London Hospital, to be called "King Edward VII Memorial Cot." The tablet to be placed over the cot will be surmounted with the Royal Arms.

THE annual meeting of the Continental Anglo-American Medical Society will be held on Saturday, October 12th, at 4.30 p.m., at the residence of the Honorary Secretary, Dr. Robert Turner, 42, rue de Villejust, Paris. The annual dinner of the society will be held the same evening at the Majestic Hotel, Avenue Kléber, at 7.30 p.m., when the chair will be taken by Sir Bertrand Dawson, K.C.V.O., Physician to the London Hospital. Members intending to be present are requested to communicate with the Honorary Secretary.

THE French Congress of Surgery will hold its twenty-fifth annual meeting in Paris in October (7th to 12th), under the presidency of Inspector-General E. Delorme. The following questions are on the programme of discussions: 1. Diagnosis and treatment of cicatricial strictures of the oesophagus (to be introduced by MM. Guisez, of Paris, and Moure, of Bordeaux). 2. The clinical indications supplied by radiology in surgical affections of the stomach and intestine (to be introduced by MM. Béclère, of Paris, and Mériel, of Toulouse). 3. Coxa vara, its relations with fractures and separations of the epiphyses of the upper end of the femur (to be introduced by MM. Kirmisson, of Paris, and Froelich, of Nancy). During the congress there will be an exhibition of surgical instruments, medical electrical appliances, dressings, etc., in the great hall of the Faculty of Medicine.

IN a pamphlet on *Legislation for the Protection of Women*, Lord Charnwood argues that remedial legislation may scatter injustice and lead to worse evils. Whilst agreeing that the law relating to affiliation orders needs improvement, he recalls that "the benevolently intended provisions of the old Poor Law produced terrible demoralization in many country villages by making illegitimate children desirable assets to a household." Lord Charnwood approves the provision of the "White Slave Traffic" Bill, which gives the police power to arrest offenders without a magistrate's warrant, but thinks that the greatest check to this traffic will be concerted action between different countries. Many countries have special officers to suppress the evil, but it is somewhat discouraging to learn that though some years have been spent in negotiations no concerted action has been adopted for punishing offenders.

A COURSE of lectures on common sense cooking in health and disease, intended primarily for health visitors, nurses, and voluntary health workers, will be delivered at the house of the Society of Medical Officers of Health, 1, Upper Montague Street, Russell Square, W.C., during October. The course will be conducted by Dr. F. S. Toogood, Medical Superintendent of the Lewisham Infirmary, with the assistance of Dr. Reginald Dudfield, M.O.H., Paddington, Dr. R. A. Lyster, County Medical Officer of Health for Hampshire, Dr. Joseph Priestley, M.O.H., Lambeth, and Mr. William Lawton, executive secretary of the society. At the first lecture, on Wednesday, October 16th, at 2 p.m., the chair will be taken by Sir William Collins. On October 23rd a visit will be paid to street markets, the Central Meat Market, and the Fish and Game Markets, under the guidance of Dr. Toogood and Mr. Lawton.

Letters, Notes, and Answers.

AUTHORS desiring reprints of their articles published in the BRITISH MEDICAL JOURNAL are requested to communicate with the Office, 429, Strand, W.C., on receipt of proof.

CORRESPONDENTS who wish notice to be taken of their communications should authenticate them with their names—of course not necessarily for publication.

CORRESPONDENTS not answered are requested to look at the Notices to Correspondents of the following week.

ORIGINAL ARTICLES and LETTERS *forwarded for publication are understood to be offered to the* BRITISH MEDICAL JOURNAL *alone unless the contrary be stated.*

COMMUNICATIONS respecting Editorial matters should be addressed to the Editor, 429, Strand, London, W.C.; those concerning business matters, advertisements, non-delivery of the JOURNAL, etc., should be addressed to the Office, 429, Strand, London, W.C.

MANUSCRIPTS FORWARDED TO THE OFFICE OF THIS JOURNAL CANNOT UNDER ANY CIRCUMSTANCES BE RETURNED.

TELEGRAPHIC ADDRESS.—The telegraphic address of the EDITOR of the BRITISH MEDICAL JOURNAL is *Aitiology, Westrand, London.* The telegraphic address of the BRITISH MEDICAL JOURNAL is *Articulate, Westrand, London.*

TELEPHONE (National):—
2631, Gerrard, EDITOR, BRITISH MEDICAL JOURNAL.
2630, Gerrard, BRITISH MEDICAL ASSOCIATION.
2634, Gerrard, MEDICAL SECRETARY.

☞ *Queries, answers, and communications relating to subjects to which special departments of the* BRITISH MEDICAL JOURNAL *are devoted will be found under their respective headings.*

QUERIES.

S. J. F. would like to hear of a farm where a young man of 22, who suffers from epileptiform attacks, could board and work on payment of moderate premium.

NICOTINE asks for suggestions that will help a patient who wishes to discontinue the use of tobacco. Salivation is troublesome at times when smoking is stopped.

T. H. asks for suggestions in the treatment for gentleman, aged 55, who suffers from tender heels, but is in other respects quite well. Iodine, Scott's ointment, belladonna externally, and salicylate and iodide treatment internally have been tried with no effect.

ANSWERS.

DR. JOHN T. HARTILL (Willenhall) writes in reply to "Cornishman's" question: I attended a man some years ago who very frequently dislocated his shoulder during an attack of epilepsy, and I taught him to reduce it himself nine times out of ten as follows: By lying on the floor with his feet towards and his head away from the front of a stout squab or sofa, such as many working men possess, and attaching a rope to the squab in a line with the hand on the injured side, then by pulling hard at the rope with his hand, and the same time pushing at the front of the squab with his feet, he felt the humerus go into its place, and immediately let go his grip of the rope. When the shoulder has been frequently dislocated, the parts around have either been so much torn or stretched that it is always quite easy to get the bones into their proper position.

ISOLATION HOSPITAL.—Information concerning the staffing and equipment of an isolation hospital will be found in *The Prevention of Epidemics and the Construction and Management of Isolation Hospitals*, by Dr. Roger McNeill (London: J. and A. Churchill. 1894. 10s. 6d.), and in a paper on the furnishing and general administration of small isolation hospitals, by Dr. Meredith Young in vol. xix, p. 66, of the *Transactions of the Royal Sanitary Institute*, 90, Buckingham Palace Road, S.W.

J. H.—The answer is in the affirmative, but it is usually advisable to leave the assessment of damages to the lawyers.

C. O.—We are not aware of any paper or book dealing with the employment of Dr. Silk's inhaler for the purpose of administering "open ether." The inhaler was primarily designed for the use of mixtures of chloroform and ether, but has more recently been adopted for ether. The method is merely to drop ether from a dropping bottle upon the sponge in the inhaler. It is important to have a fine honeycomb sponge and to regulate the rapidity of the drops according to the requirements of the case. By avoiding soaking the sponge with the anaesthetic freezing is obviated. Some anaesthetists commence the induction with a mixture, for example, the A.C.E., the C.E. of the C.A. (one part alcohol and nine of chloroform), giving one or other of these guttatim on the sponge of the inhaler, and so soon as the patient is unconscious or struggles replacing the mixture by ether, using this anaesthetic guttatim.

"PUBLIC VACCINATOR," who asks for a pamphlet setting forth in simple language the advantages of vaccination, would find *The Truth about Vaccination* and *A Plea for the Children* specially adapted for popular distribution. The former is published by the Association of Public Vaccinators of England and Wales at 1d. each, or 2s. for 50. The latter is published by the Jenner Society and contains numerous illustrations, price 1d. each, or 2s. 6d. for 50. Copies of both can be obtained on application to Dr. Drury, Landon House, Halifax.

LETTERS, NOTES, ETC.

DOCTORS AND DISPENSING.

DR. GRIFFITH C. WILKIN (Paignton) writes: May I point out to your correspondent "Westcountryman" that there is another very important question to be considered in dispensing. When I first began country practice between twenty and thirty years ago there was a chemist in the village, and running short of a drug—I think it was a decoction—I got a small quantity from the chemist. On using it I found it mixed a different colour to that which I had formerly been using. A little later I mentioned this to the traveller of the firm I dealt with. His reply was: "When I call for orders from doctors they say the drugs and quantities they want and nothing about the price; therefore, of course, we give them the best quality. When I go to a chemist he says, 'I have so much money to spend; for it I require these drugs,' mentioning names and quantities. Naturally we cannot afford to give him the first quality drug. Hence, probably, the difference you speak of." Surely the first duty of a doctor is to see that his patients have the best advice and treatment. No one can do the dispensing so well as he can himself.

TREATMENT OF AMOEBIC DISEASE.

A PAPER by Major Leonard Rogers, Professor of Pathology, Calcutta Medical College, entitled "Further Experience of the Specific Curative Action in Amoebic Disease of Hypodermic Injections of Soluble Salts of Emetine," was published in the JOURNAL of August 24th (p. 405). The following addendum reached us too late for insertion in that number: "Since the above was written I have tried the effect of giving emetine hydrochloride by the mouth on an empty stomach, and have found that doses of one or two of Burroughs and Wellcome's one-third of a grain tabloid thus administered rarely cause any sickness or nausea, and are very efficient in the treatment of amoebic dysentery. This further discovery will greatly extend the scope of the new line of treatment under conditions which do not readily allow of the repeated hypodermic use of the drug."

"TUBERCLE."

A TORONTO GRADUATE writes: By consulting *The Transactions of the Royal Colonial Institute*, your correspondent (BRITISH MEDICAL JOURNAL, August 17th) will find a very interesting paper by the Hon. Judge Russell on "Jamaica: a Home for the Invalid and Settler." At the request of the editor of the *Daily Gleaner*, Kingston, Jamaica, Dr. Logan Russell, J.P., gave a somewhat lengthened article on the advantage of the climate for consumptives. As Dr. Russell was once on the resident staff of the Consumption Hospital, it may be presumed he had some special knowledge on the subject. He wrote on the advantages of Santa Cruz mountains, describing the air as simply perfection, and, unless the case be too far advanced, amelioration and cure resulted. I came across quite a number of persons who gave a quite distinct history of phthisis, and attributed their cure to Malvern air. By writing to the *Gleaner* some information may be obtained. I may state the climate is ideal, simply lovely, mental and physical strain relieved, a buoyancy difficult to describe, nights cool, days warm, devoid of the excessive heat of the lowlands. I remember a gentleman attached to a large Liverpool firm, scarcely able to drag one foot after the other, cough and expectoration, emaciation, indigestion, no appetite—in fact, done up and looking as if he was walking around to save funeral expenses. In a few weeks the change for the better was so marked that his mother could scarcely recognize him. To my idea it is the ideal spot for a sanatorium. Living at Malvern (the town of Santa Cruz mountains) is good and moderate. I should say a man on £120 to £150 a year would do better there than on double that sum in Britain, and perhaps after he could get the run of things that sum could be materially reduced. Outdoor living in Canada is out of the question. A consumptive will have hard time bucking up against from 12° to 50° below zero, and it is a sin to send him there. I, so to speak, know every inch of the ground from Halifax to Collingwood. (I was an old Upper Canada College schoolboy, so can talk about frost.) This new sanatorium dodge under the National Health Act will prove a snare and a delusion and a white elephant on taxpayers' pockets. I have just received a few *Gleaners* from the island. They are at "Tubercle's" service if he desires.

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